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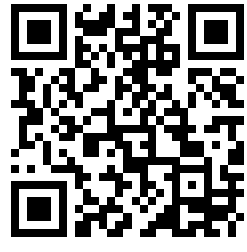

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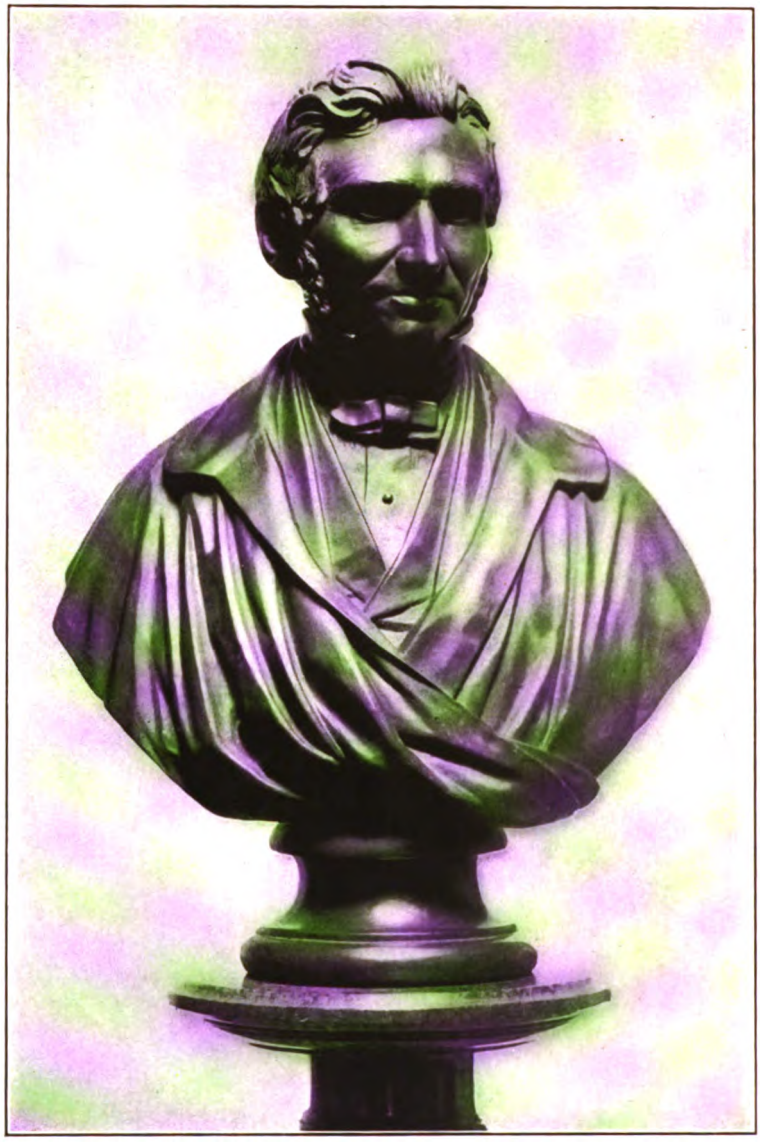

Courtesy U. S. Rubber Co.

CHARLES GOODYEAR

Inventor of vulcanization, founder of rubber industry and therefore "Father of the Automobile Industry."

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The Romance
OF THE
Automobile Industry

Being the Story of its Development—its Contribution to Health and Prosperity—its Influence on Eugenics—its Effect on Personal Efficiency—and its Service and Mission to Humanity as the Latest and Greatest Phase of Transportation.

BY

JAMES ROOD DOOLITTLE, Editor

Assisted by the most Eminent Authorities of the Industry.

NEW YORK

THE KLEBOLD PRESS

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PREFACE

THE automobile is the most important device ever made by man, and the purpose of this work is to tell its story.

There have been numerous attempts to cover the subject and some of them have been excellent in their intention and execution. The mechanical and technical labors of several masterly engineers have told in detail of the development of the automobile, as a machine, and a number of less well-intentioned and able laymen have tried to present the case from the so-called popular point of view. These latter found scant attention from the industry and rather less from the individual motorist and as a broad general thing, the user of the car scorned the mechanical works as well.

Consequently, the curious condition has developed, where the bare facts concerning the social, commercial, financial, economic, therapeutic and eugenic phases of the automobile and its giant industry are unknown.

Nobody will read mechanical formulæ and purely engineering matter but engineers, who in many instances know quite as much about such things as the authors of such works, and therefore text-books of that description are useful only for the purposes of instructing students; for recording the art and for court proceedings.

When the great automobile makers cannot persuade their customers to read the carefully prepared instruction books, it is quite manifest that the time is not ripe for another engineering work.

The time never was ripe for any work based on paid publicity or open to the suspicion of advertising taint.

The real story of the automobile is more wonderful than the fanciful tale of Aladdin's Lamp. It is more romantic than "Romeo and Juliet." It is more important than the history of anything else in the world, because it deals with the latest and by far the greatest phase of the art of transportation. Transportation has been the ladder upon which humanity has climbed, rung by rung, from a condition of primitive savagery to the complex degree of civilization enjoyed by man in the twentieth century.

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There has been more real progress in the past ten years than in the ten centuries that went before. There is not a single element in the human race that is standing still. Every direction in which human ingenuity has been exerted heretofore is fairly seething with progress.

Thus it has ever been in the development of transportation. Any improvement means a stride forward and the greater the improvement in the means of transportation; the more people it affects, the more general must be the advancement in human well-being.

The master minds of all ages have confirmed the importance of transportation, but even to-day with something over 4,000,000 cars either scheduled or in existence, there is a surprising tendency on the part of the intelligent public to withhold credit from the automobile as a basic element of the basic art.

Realizing our limitations and rather appalled at the magnitude of the work even in its simplest form, we present the following narrative story as the best we are capable of producing. We make no excuses for it. We have deliberately avoided paying too much attention to the ancient history, or to giving too much credit to those early investigators whose work showed that if the development of the automobile had depended upon their ideas, it would have ended with their inventions.

The story has been told from beginning to end twelve times in this work. We have taken twelve different points of view. When, in our opinion, the effect of a man's influence or the introduction of a mechanical element has had a constructive effect upon the automobile in any of its phases, we have mentioned names and called attention to effects. We have gone to some pains to detail the lives and services of certain individuals, more as examples than in any effort to compile a representative biography, but not one cent has been required, desired or accepted on that behalf.

With the hope that the influence of this work may broaden and increase the scope and use of the automobile by interesting the public, we present this volume.

JAMES ROOD DOOLITTLE, *Editor.*

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CONTENTS

PAGE

PREFACE v

The scope and purpose of the work.

INTRODUCTION ix

A brief article on transportation, of which the automobile is the latest and greatest phases.

CHAPTER I. The Development of the Automobile 1

A human interest story of the development of the automobile from 1760 to 1916, outlining the progressive stages in the car's growth. The Steam, Electric and Gasoline phases are described and treated.

CHAPTER II. The Romance of the Inventors 53

The stories of Selden, Ford, Canfield, Carlson, Coleman, Parsons, Perlman and Grant, whose works have been passed upon by the highest patent courts.

CHAPTER III. The Romance of Rubber 107

The tire as the fundamental basis of the car. The stories of the service of Goodyear, Wickham, Jeffery, Welch, Bartlett, Dunlop, Straus, Palmer and others. Rubber, past, present and future.

CHAPTER IV. The Romance of Manufacturing 137

The wonderful story of the automobile industry, in which standardization of routine, materials and small details, with the use of special steels, and administered by scientific business methods have produced a business unique in the world's history. How the automobile has proved to be the most powerful economic force that humanity ever harnessed.

CHAPTER V. The Romance of the Organizations 163

Outline stories of the National Automobile Chamber of Commerce and its predecessors; the Motor and Accessory Manufacturers; the Society of Automobile Engineers; the American Automobile Association, and the Automobile Club of America. Brief sketches of Charles Clifton, H. M. Swetland, Frank G. Webb, A. R. Shattuck and others.

CHAPTER VI. The History of the Law 243

Students have pronounced the automobile laws of the past and present to be the worst example of discrimination in modern history. How to correct this condition. How the British lawmakers hampered the automobile.

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PAGE

CHAPTER VII. Good Roads 263

The automobile was born into a world that was practically roadless and is accountable for nearly all the highway improvements, present or prospective. Improvements of roads and the means of transportation have added more wealth to America's store in ten years than could be measured by the total gold dug from the earth in ten centuries. The roads and cars have widened the area of producing lands and should be credited with the revolutionary changes apparent in the so-called rural districts.

CHAPTER VIII. The Romance of Finance 285

Money changed the making of automobiles from a game to an industry practically overnight. In return, the automobile has established itself as the chief new financial factor in national industrial finance. The story of Aladdin's Lamp did not compare in its wonders with the story of automobile finance. The earnings of a transcontinental railroad system are comparable with those of a good active automobile factory. Yet money fought shy of the industry until conditions arose of such grave portent to the whole commercial fabric that the financiers slowly and cautiously yielded, only to find a dubious investment transmuted into gold under their hands.

CHAPTER IX. The Romance of Speed 317

There is nothing wrong about speed. Speed is a constructive force in all human affairs, representing the good, where its opposite represents the bad in everything man undertakes. The automobile is the only improvement in road transportation since Babylonian times. It can go further and faster than any other road transportation. The story of how automobile speed has developed from 15 to over 100 miles an hour, and what it means to civilization.

CHAPTER X. The Romance of the Truck 341

A complete outline of the commercial automobile industry in America and an essay showing the economic reason why the horse must go.

CHAPTER XI. The Romance of Progress 393

A series of articles taking up the things accomplished by the automobile, including: The Car as a Stimulant to the Growth of Cities; The Automobile as a Force in Eugenics—in Hygienics—in Railroad Traffic—in the Cheapening and Improvement of Food—in the Emancipation of Women—as an Element in the Development of Salesmanship, etc.

CHAPTER XII. The Mission of the Automobile 433

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INTRODUCTION

THE automobile, Father of the Locomotive; the greatest and most insistent producer of Good Roads; the only improvement in road transportation since Moses, and the most important influence on civilization of all time, has flowered and fruited on American soil. There are at least seven times as many automobiles of American manufacture in present being or included in current manufacturing schedules, as there are in all the rest of the world.

We did not invent the first car that ran; we did not invent the internal-combustion hydro-carbon motor that is universally used in the art to-day; we did not invent the first tires, but we have taught our teachers almost everything modern they know about such things. The efforts of American manufacturers have proved a revelation to the world and at the same time, the American inventors have played no mean part.

None of man's other works compares with the automobile viewed from the standpoint of results, which is the true measure of any improvement.

Man has been seeking betterments in transportation ever since he lived in caves and dens and fought wild beasts with stone hatchets. The notable thing about progress in civilization has been that improvements in transportation have always preceded and at some distance, the advancement. Consequently the pioneers in transportation have ever met with scant rewards, in a material sense.

Man, himself, was the first of all transportation. His arms and back afforded the earliest means of carrying freight from place to place. Long before man learned to record his achievements, even in the rudest fashion, he knew how to make a raft that would float down stream and to burn out a log that could be navigated up-stream.

Fragments of baked earthenware containing primitive efforts at hieroglyphics, discovered below the foundations of Babylon, the cradle of the human race, tell of wheeled vehicles. Indeed it would be hard to predicate the roughest and smallest building of prehistoric times on any hypothesis in which the wheel was not the central element.

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Without wheeled vehicles, buildings would be impossible and without buildings, of some sort, there could have been no civilization. The Pyramid of Cheops; the Walls of Babylon, or the Panama Canal, never could have existed but for wheels. Therefore, it may be said without fear of serious challenge that real civilization traces back to the first wheel or its equivalent.

The written records of mankind, antedating by several centuries, Sargon king of Babylon, who ruled about 3800 B.C., tell of wheeled vehicles and their use in a way that indicates a knowledge of that part of the art of transportation before man learned to record his wisdom.

Certain it is that the civilization of Babylon was superior to that of contemporary cities, tribes and nations, which, of course, were less favored with knowledge of transportation than the Babylonians.

Man learned to utilize the strength of animals to carry burdens; to carry himself and to draw sledges and finally wheeled vehicles.

All the civic glories of the ancient world were based upon the wheel with the same completeness and entirety that the modern achievements of humanity are so based. With the wheel—everything: Without the wheel—nothing.

From the time of Rameses II almost to the administration of President William McKinley, there were no material improvements in actual transportation conditions so far as they apply to road traffic. It is true that the bicycle burst upon the consciousness of man and had a wide vogue from 1870 to 1900, but aside from the bicycle, the actual, practical factors in road transportation that were added to the store of human possession during 3000 years before A.D. 1900, were solely in the nature of developments and improvements on the ox-cart of Pharaoh and the chariot of Cæsar.

Man's ingenuity, having perfected vehicles that could be drawn 4 miles an hour for 20 miles a day, sought other avenues of industry and development. The sailing vessel was perfected so that Columbus was enabled to sail across the unknown sea; discover a new continent and return in safety. In 1600 it was vastly easier from the viewpoint of physical comfort to make a voyage by sea of 7000 miles than many a journey on land of 100 miles. At the beginning of the 18th Century land travel was confined almost exclusively to military operations and the internal traffic of various countries. Sea travel had been so much improved that it was possible to reach any port in comfort and safety, but the journey from London to Glasgow overland, or from

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New York to Boston over the ancient Boston Post Road, were still very serious undertakings.

The disproportion between the comfort and speed of the sea traffic and the arduousness of land travel became more and more burdensome as the years passed along. The excellent progress on sea, emphasized the disadvantages of land traffic and the pendulum of human ingenuity swung back.

Man set about the task of making travel by land swifter and surer to compensate for the improvements on the sea. He had already developed animal power as a factor in transportation to the ultimate limit. Flesh and blood have only a certain field beyond which they cannot go. The horse, which had borne the burden of man's development for 40 centuries could do nothing more to improve conditions.

Thus: Man turned his inventive faculties toward the idea of something that would simplify road transportation by making it swifter and more certain. For centuries before 1700 this striving for better road transportation was wide spread. There have come down to us fragmentary records and stories and legends of man's efforts to solve the problem. In China in the 16th Century, according to a legend of very uncertain authenticity, there were carriages propelled in some mysterious way. It is said that one at least was equipped with a steam boiler, the vapor from which was projected against the wings of a fan-like propeller, causing them to revolve. This actuated a shaft and the power was transmitted to the driving wheels by belts. Modern engineers tell us that if the boiler was large enough to generate a current of steam sufficiently powerful to do what is alleged to have been accomplished by it, it would necessarily be so heavy that it would firmly anchor any vehicle that could have been made to carry it.

We will dismiss the Chinese "prior art" with no further comment.

The steam engine was developed to commercial use in the 18th Century and while the early forms were designed for stationary service as pumps and power generators, the idea of applying steam to the propelling of vehicles received exhaustive investigation and research almost to the limits of the civilized world of those days.

For fifty years, prior to 1770, the inventive minds of the world wrestled with the subject of bettering road transportation. When the steam engine principle was developed far enough it was applied to the road vehicle.

The first results secured were like any other experiments—crude,

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mechanically imperfect and unsatisfactory in service. Development was gradual, but it went far enough to establish the absolute right of the automobile to the distinction of being known as the Father of the Locomotive.

About 1830 in England there were numerous steam automobiles, possessing every essential mechanical principle of serviceable road vehicles. There were several vital faults in these machines aside from their mechanical make-up. First they were heavy and cumbersome and their effect on the roads of those days may be imagined. Second, they emitted thunderous noise and the sparks and smoke were actually dangerous to life and property, to say nothing of the perturbation of spirit caused to old Dobbin and his owner. At any rate, they were legislated out of existence in Great Britain and proved themselves so destructive of roads in other countries that the embryo industry flattened out like a pricked balloon.

It had been demonstrated to the satisfaction of the general run of mankind that as a road vehicle, the steam locomotive was unsatisfactory and as a direct consequence, the most potent inventors and adaptors turned their attention toward perfecting the idea of utilizing the steam engine for propelling boats and locomotives on tracks.

The automobile languished and like so many other promising inventions, probably never would have appeared again had it not been for the discovery of the process by which rubber can be vulcanized.

Goodyear's discovery antedates the period of the modern automobile by many years but the development of the pneumatic tire did not come until after the bicycle had been in use for a dozen years.

With a startling suddenness the tire came into being and made possible the operation of the automobile as a road vehicle.

In what we have said about the essential character of rubber as the foundation of the modern automobile, there is no intention of taking anything of credit away from the investigators, pioneers and inventors who selected the basic idea of the gasoline engine; who perfected it so that it was able to deliver ten times the proportionate amount of power of a steam locomotive running on rails and who applied it to the road vehicle. There is no intention of subtracting anything from the inventors of the clutch, transmission or any other vital part of the automobile when we say that the vulcanization of rubber lies at the foundation course of the great motor fabric of to-day.

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If the pioneer steam-cars had not destroyed the roads and jarred themselves apart they would have been developed to mechanical perfection a century ago, instead of being legislated out of existence as a general nuisance. If the inventions of Cugnot, Murdock, Evans, Trevithick, Hancock, Gurney and others had been equipped with tires that would not tear up the roads, and that would have protected them from undue vibration, inventive means undoubtedly would have been found to correct their weight, crudity, danger and uncertainty. If the inventions of Benz, Daimler, Selden, Duryea, Ford, Haynes and others had been lacking in rubber tires, who can say that there would be an automobile industry to-day?

Happily, however, for the well-being of humanity, the tire came along almost coincidentally with the vital improvements in the petrol engine and the other great practical engineering strides that differentiate the modern automobile from every form of transportation that came before it.

As an economic force the automobile multiplied the possibilities of road transportation by ten. Where Pharaoh, Cæsar, Charlemagne, and Victoria were limited in their reigns to a speed of four miles an hour on the road and a working radius of action of twenty miles a day, the people of their kingdoms to-day enjoy facilities of road transportation of forty miles an hour and two hundred miles a day!

If the pack, raft, drag, sledge, catamaran, sailing vessels, the wheel, the draught animal, the steamship and the railroad have marked successive steps that developed man from a wild animal to a complex degree of civilization, does it not prove that the automobile, which has multiplied transportation facilities in such a wonderful measure, should be crowned as the latest and greatest phase of the art?

We are too close to the focus of the camera to appreciate exactly what the automobile already has accomplished for mankind. We are astonished when we learn that instead of being a drain upon the wealth of the country through the billions of dollars that have been spent upon it, that it has not only paid its own way and now has a credit balance sufficient to defray every possible expense on its account for ten years to come, but that it has also checked one financial cataclysm and entirely prevented another that threatened quite as serious results as the disturbance of 1907.

We only dimly realize that the remote and rocky hills, far from rail-

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roads, that are now dotted with homes, villas and mansions, were barren and almost without value twenty years ago and to-day are carried on the tax-rolls at substantial figures.

We, to-day, are just beginning to understand why the farmer, living quite as far away from the city as he did formerly, can keep his best boy interested in the farm, instead of losing him to the city the moment the young man realized the isolation of the farm.

We all know that the health of the public is better than it used to be. Man lives longer than he did a few years ago. And he also lives better. Life is better worth the living. Man is more efficient. He reaches contact with his fellows as never before. He has burst the bonds that tied him to narrow localities.

The only new thing that has been added to man's possessions in twenty years should be credited with all these very practical results. It was the automobile and the automobile alone that brought them about.

Our thanks and humble acknowledgments are tendered to the whole automobile fraternity for the liberal help afforded in the compilation of this work, but especially we wish to render thanks to the following gentlemen who gave of their valuable time and labor, to make the work possible: William A. Redding, LL.D.; Roberts Walker, M.A., LL.B.; Herman F. Cuntz, M.E.; William Phelps Eno; Albert R. Shattuck; E. R. Hollander; William K. Vanderbilt, Jr.; Leonard H. Dyer, LL.B.; William C. Durant; Henry Ford; Henry B. Joy; Charles Clifton; Elwood Haynes; Horace M. Swetland; Lewis R. Speare; Amos G. Batchelder; William M. Sweet, Alfred Reeves, James S Marvin; Frank G. Webb; Ernest L. Ferguson and numerous others.

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THE ROMANCE
OF THE
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THE ROMANCE OF THE AUTOMOBILE INDUSTRY

CHAPTER I

THE DEVELOPMENT OF THE AUTOMOBILE

THE first automobile was built and tried fifty years before the first railroad track was constructed. It was the response to the subconscious but very general demand of humanity for improvement in the means of transportation on the common roads. One of the earliest uses to which the newly invented steam engine was put was as motive power for the automobile.

In fact, the results secured by Captain Nicholas Joseph Cugnot between 1760 and 1770, probably entitle him to broader honors than the single glory of being the inventor of the first motor-propelled road vehicle that actually ran, for it is likely that he should be rated among the first steam-engine makers.

Cugnot was born at Void, in Lorraine, France, September 25, 1725. He was educated for service in the engineering branch of the French army. He was something of a soldier of fortune and before he had reached the age of thirty-five, he had seen service in several European countries.

With his other inventions this work will not deal, except to say that he devised a cavalry gun that brought him into favor with the Compte de Saxe, who probably supplied the funds for Cugnot to build his earlier road engines.

Cugnot built three automobiles, two of which were experimental and of which nothing but legends remain. The last one was constructed in 1769 and was extensively tried under the auspices of the French Minister of War, the Duc de Choiseul. It was designed and intended for use as tractor for a field gun, but it proved to be clumsy and overbalanced by the weight of its boiler and engine in front and was difficult to steer. In fact it ran into a wall on one of its numerous trips and was partly wrecked. The inventor never tried to rebuild it or make

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further experiments. The machine was placed in the Conservatory of Arts and Trades in Paris where, to-day, it is still an object of much interest.

Cugnot was rewarded with a pension of 600 livres a year for his accomplishments by Louis XV, but when the country was engulfed by the Revolution it lapsed and he lived in poverty until after Napoleon was established as First Consul, when the pension was restored and increased to 1000 livres a year.

This inventor, who was undoubtedly the "Father of the Automobile," died in Paris, October 2, 1804.

His car was a crude affair, consisting of two parts; a tractor having a single driving wheel, actuated by two single-acting brass cylinders, communicating with the boiler by steam pipe; and a wagon, which could have been replaced by a field-gun.

The method of driving was very ingenious. Ratchet wheels were located on either side of the drive wheel. The pistons acting first on one ratchet wheel and then the other turned the driving wheel by quarter revolutions through a clever arrangement of piston-rods, pawls working into the ratchet wheels and gearing to make certain the successive action of the pistons.

The boiler was round and made of copper and contained the fire pot and chimneys. It was possible to run this Cugnot automobile only a short distance without replenishing the supply of water, because the exhaust of live steam soon left the boiler dry.

Considering the state of the steam-engine art at that period, the accomplishment of this pioneer was very remarkable, but the effect of Cugnot's effort exerted a much smaller influence on subsequent developments than might reasonably be expected.

His unique method of transmitting the power of his engine to the driving wheel involved mechanical complications that prevented smooth operation and anything like high speed was necessarily out of the question because it required four power strokes of the pistons to make one revolution of the driving wheel.

But Nicholas Joseph Cugnot was the pioneer. To him must be given the credit for producing the first motor-propelled road vehicle.

With regard to his earlier efforts there is little definite information in existence to-day. He unquestionably built a smaller car about 1765, which developed two and a quarter miles per hour and which evolved pump troubles in operation. The boiler proved to be too small

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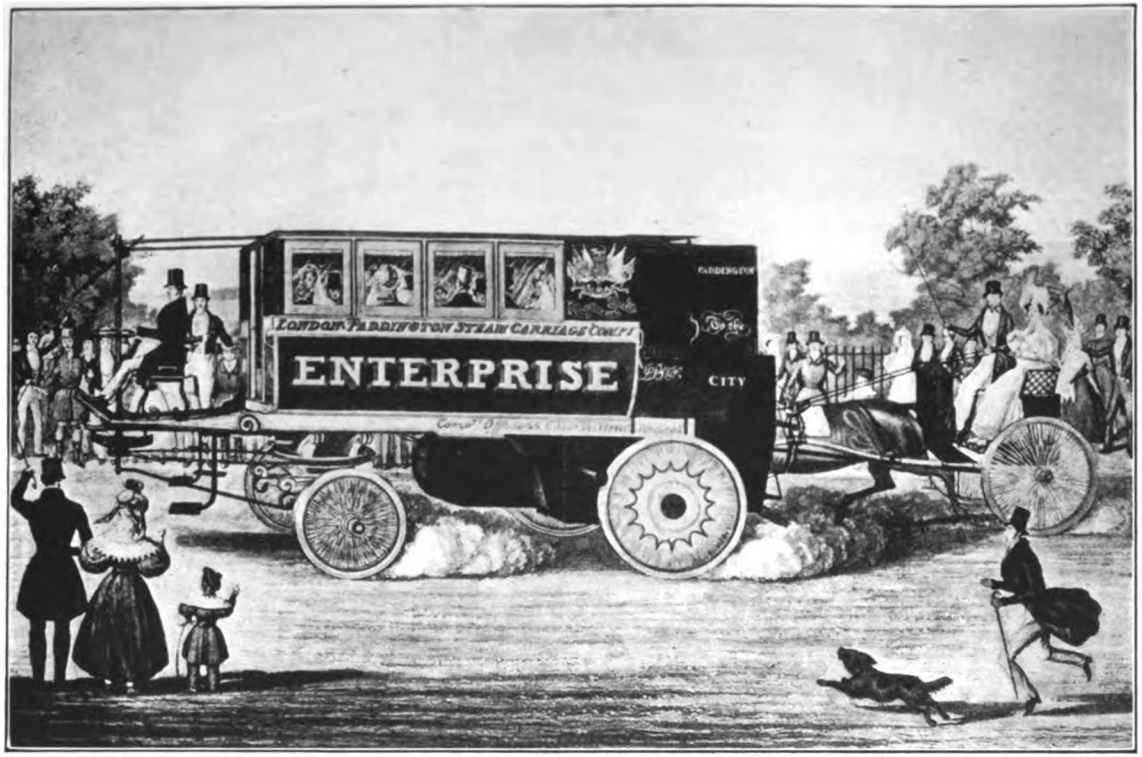

WALTER HANCOCK'S "ENTERPRISE," FROM A DRAWING MADE IN 1833

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AN EARLY BRITISH STEAM STAGE

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and it was necessary to stop frequently for water as well as to get up sufficient steam pressure.

We know that he must have built and tried a car about 1765, because the Compte de Saxe and the French Minister of War apparently knew all about the earlier machine when the latter ordered Cugnot to construct the machine that now lies in the Conservatory.

But there are fragmentary notes of correspondence and a reference or two in the diary of the Compte de Saxe that tell of a still smaller car built, probably in 1760 in Brussels, but there is no record that this crude experiment ever ran.

Cugnot's work was passed upon by Major Planta, an engineer officer of the Swiss army before the official trial trip. Planta, himself engaged in building a steam automobile about the time that the pioneer was completing his third effort, examined Cugnot's plans and was so impressed with them that he reported favorably upon the work of the French officer and abandoned his own endeavors along that line.

Cugnot may have had the benefit of the invention and development and investigation of James Watt, whose successful experiments in steam engineering, conducted originally at Glasgow University after 1755, resulted in the discovery of the practical application of steam to the production of power, but it should be remembered that Watt did not build engines for commercial use until he became associated with Matthew Boulton under the firm name of Boulton & Watt at Soho, near London, in 1774. Prior to that time he had made numerous engines in the university laboratory, but it is doubtful that Cugnot received much definite information from them that was useful in the construction of his automobiles.

Watt was a conservative with regard to the use of the steam engine as motive power for road vehicles. At the time of the Cugnot experiments and success and in fact to the end of his life, in 1819, he discouraged all efforts to apply his engine or any adaptation of it to the solution of the problem of road transportation. He prevented William Murdock, a skilled employé of his firm from developing his really constructive and important ideas on the automobile.

Murdock entered Watt's employ at the age of twenty-three, in 1777, and remained with that firm throughout his active life. Watt always held the opinion that the common roads of his time placed an insuperable obstacle in the way of using the steam engine for road transportation. Thus, when Murdock invented and made a model road

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vehicle, driven by a single-cylinder engine three-quarters inch in bore and one and a half inches in stroke, which in tests proved to be much more efficient than the invention of Cugnot, Watt discouraged him and threw cold water on his plans for manufacturing the automobile. This model, built and tested in 1784, is still in existence at the British Museum. Murdock made several other cars, in model size, but never built a full-sized machine or patented any of his automobile ideas.

The most important application of improvements made by Murdock with relation to the Cugnot effort was in the abandonment of the quarter-revolution, ratchet-drive used by the French engineer and the substitution of a crank for the conversion of the reciprocating motion of the steam engine into rotary motion. But credit for this idea is not due to Murdock, but rather to Pickard, who patented it in 1780.

Richard Trevithick built a steam automobile at Camborne, England, which was given a severe trial on Christmas Eve, 1801, during a blinding rain storm. The car performed admirably over a hill course of 1 mile and the next day made a trip of 6 miles.

The carriage was similar in appearance to a stage coach and had places for several passengers. On the first trial, six, or seven grown men rode most of the distance traveled.

The engine, boiler, and furnace-box were placed at the rear of Trevithick's carriage, where the fireman or engineer could attend to them. The motor was composed of a single cylinder, the motion of the piston rod being transmitted to the driving wheels through the medium of a spur-gear and crank axle. The driving axle was mounted with a fly-wheel. Trevithick took power for his bellows, steam-cocks and force-pump from the same crank axle. This engine was one of the first high-pressure engines, using the elasticity of steam to move the piston against the pressure of the atmosphere.

In 1803 Trevithick built his second car, which was driven by a single horizontal cylinder having a bore of 5½ inches and a stroke of 30 inches! This engine worked very well with 30 pounds of steam pressure, making five strokes to the minute. It may be noted that the driving wheels were 10 feet in diameter. It was tried out on numerous occasions in London. While neither of Trevithick's cars were practical automobiles in any sense, his development of the high-pressure steam engine entitles him to rank among the pioneers of the ancient art.

The first American automobile was built under a patent granted by

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the state of Maryland, before the national control of patent matters had been perfected. The legislature of that state was petitioned in 1787 to grant the exclusive right to make and use carriages propelled by steam within its borders, to Oliver Evans of Philadelphia.

The experimental work of Cugnot was known to Evans only in the vaguest terms at the time of the application and, in fact, he never attempted to build an automobile so pretentious as that of the pioneer Frenchman. He perfected several steam engines that proved useful in other arts and in 1804 was commissioned to build a steam-propelled flat-boat to be used in cleaning the docks of the city of Philadelphia.

The order for this boat was given by the Board of Health of that city, and Evans, after constructing a 5-horsepower engine, thought he saw a way to advertise the fact that steam could be used on land vehicles quite as well as on water. So he built the flat-boat, according to the requirements of the Board of Health; mounted his engine upon it and then built a four-wheeled wagon, strong enough to transport the boat and engine. By a series of belts and gearing, he arranged this clumsy vehicle so that the power of the engine could be transmitted to the wheels and rigged the temporary mechanism so that he was able actually to make it go.

After a number of surreptitious trials, he announced to the authorities that he was ready to perform his advertising feat. It was little more than that in fact, but on the day set, he had the satisfaction of driving his machine up Market Street; around the circle where the city hall and William Penn's statue now stand and down to the waterworks, where the running gear was stripped away; a paddle-wheel rigged astern and the automobile, transformed into a motor boat, was launched in the Schuylkill River. It moved down stream to the Delaware and from thence steamed northward as far as Trenton, N. J.

Evans' principal service to the art of transportation was his development of the high-pressure non-condensing engine. Trevithick had the benefit of Evans' research and practice, as the plans and specifications worked out by the American inventor for that type of engine were sent to England for inspection in 1784.

Oliver Evans was given the appellation of "The American Watt," but there is no way in which to compare him with the Scottish engineer. Watt was a university man and Evans had a common school education. Watt had the data of the whole world's research at his com-

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mand but Evans' sole knowledge of steam and its application to motors was derived from fragmentary reading and personal experimentation. Watt had practically endless resources and Evans had to fight tooth and nail for every financial concession he was able to secure.

And yet, Oliver Evans constructed high-pressure, non-condensing steam engines when Watt was still developing the efficiency of low-pressure engines and before Trevithick was starting to learn his work.

He was so far ahead of his time that even with the clever advertising he devised to arouse interest in self-propelled vehicles, and in spite of his rather spectacular methods of attracting attention to their possibilities, he was forced to abandon his efforts in that direction shortly after his successful demonstration in Philadelphia.

Evans was full of true sporting blood and one gigantic bluff he made just after the trip referred to, has endeared him to the hearts of motordom.

It appears that the people of Philadelphia took themselves quite as seriously in that day as they have since, and when they saw the lumbering, creaking vehicle labor up Market Street, they took it for granted that they were witnessing a maximum performance. Some of them at any rate concluded that because the friction of wooden axletrees, supporting a body and engine which weighed, all told with fuel and everything else, something more than 5 tons, was hard to overcome with a puny little motor; and because the vehicle was strange to see on the streets, that it must of necessity be condemned.

They ridiculed the idea of driving such a weighty vehicle, because its rate of speed was not high.

Evans, who was a man of nerve and force, shook his finger under the nose of his chief tormentor and pulled a bag of currency, containing his payment for the vehicle from his pocket, offering to bet $3000 in cold cash that he could make a steam carriage that would go faster over the Lancaster Turnpike for 5 miles than any horse the other fellow might select.

It has been recorded that the tormentor of the inventor was obliged to back down completely.

Nevertheless, Evans was unable to stir up any special interest in his work and he gave it up. In the latter part of his life he established an iron foundry in Philadelphia and died, leaving a considerable fortune. He was born in Delaware in 1755 and died in Philadelphia in

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DE DION BOUTON TRACTOR (1894)

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THE PANHARD OF 1894

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1819, a successful and honored citizen, but almost forgotten as the first American automobile maker.

In summing up the automobile art from 1760 to 1804, the works of Cugnot, Trevithick and Evans stand out. Murdock's ideas, smothered under the discouragement of Watt, would have been equally important as those of the immortal trio, if he could have labored outside that influence. There had been literally thousands of attempts to solve the problem of road transportation prior to 1804. Hundreds of inventors progressed as far as the construction of models and many of them discovered isolated details, some traces of which remain even in the modern automobile. But up to that time, nothing like a practical road vehicle had been produced.

The main objections to the early automobiles were that they were imperfect mechanically; noisy and uncertain in operation, slow, uncomfortable and dangerous. If one could imagine the groaning of the pawls and ratchets of Cugnot's machine; the 10-foot driving wheels of Trevithick's carriage and the grotesque appearance and halting gait of the Evans vehicle, one could gain at least a superficial impression of the difficulties the inventors were trying to overcome. There was a distinct reason for each of those conditions and they all had to be modified and corrected before even the next stage in development could be reached.

The mass of research work done by the inventors of this period is appalling. The amount of futile labor and the amounts of energy and capital that were vainly spent were enormous. With the failures, the automobile industry of to-day has no interest, except in so far as the failures serve as a warning or teach a lesson. It may be said in passing, however, that there is quite as much fruitless effort wasted on useless inventions to-day as there was in the early part of the Nineteenth Century, perhaps more. It should be remembered that applications for patents on non-refillable bottles and for perpetual motion machines are still coming in to the patent office in undiminished quantities.

The next commanding figure to emerge from the ranks of inventors was William Henry James who patented a water-tube boiler for road locomotives in England in 1823 and built the most practical automobile produced so far, in 1824. This was a passenger coach with accommodations for twenty. Each driving wheel was actuated by a pair of cylinders which received steam from a main pipe emerging

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from the boiler. The most remarkable thing about this carriage was the fact that a steam pressure of 200 pounds per inch was maintained. The independent application of power to the two drive wheels supplied the equivalent of differential action. This car was run satisfactorily, from an experimental point of view, but in 1829 James, having secured the backing of Sir James C. Anderson, a very wealthy man, built another carriage which weighed 6000 pounds and developed a speed of from 12 to 15 miles an hour over poor gravel roads, carrying twenty passengers. Despite the fact that James foresaw mechanical troubles due to road shocks and vibration caused by the comparatively high rate of speed possible from the use of such high power, and had armed himself against them by equipping his carriages with laminated steel springs, vibration put an end to his development of the automobile.

The James carriages were quite as carefully made as those that came before and had the advantage of fine springs, but they never succeeded in running more than a few miles at a time. Road shocks broke steam joints and connections every few miles, or caused the tubes to work apart, or put some other vital part of the mechanism out of use. The cars proved themselves to be distinctly more efficient than the earlier experiments, but due calculation had not been made to perfect their mechanical make-up to correspond with the new degree of power and speed that they embodied.

James died in the almshouse when nearly 100 years old, in 1873, fifty years after he took out his patent on the tubular boiler, and at the time of his death it seemed that the solution of the problem was quite as far distant as it had been when he laid it down.

The two main reasons for this strange lapse may be found in the worldwide interest that was being focused on railroads and the fact that there was no means at that period for cushioning automobile mechanism from road shocks.

Pecqueur, chief of the shops at the Conservatory of Arts and Trades, Paris, made a steam wagon in 1828 in which he used for the first time in the art, a planet gearing that proved to be the substantial origin of the idea of the differential, or balance mechanism which allows one driving wheel of an automobile to run faster than the other in rounding a corner. The principle discovered by Pecqueur is in use to-day, not only in automobiles of every sort, but also in machine tools where compensating action is required.

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Commencing with Goldsworthy Gurney in 1825, the early British automobile art made considerable progress. Gurney's first full-sized car was a failure as an automobile but it demonstrated that the engineers of the future need have no fear but that sufficient friction could be had between the driving wheels and the road to insure propulsion. The following year he built another car, in which the engine was concealed in a capacious boot at the rear. In 1828 he made a trip from London of nearly 200 miles and returned without serious mishap, making as much as 12 miles an hour for part of the journey.

In 1830 Sir Charles Dance ordered several machines from Gurney and in 1831 Sir Charles made the trip from Gloucester to Cheltenham, nine miles, four times a day for four successive months without mishap of any consequence.

This looked as if the real automobile had arrived and at about 1830 there were numerous engineers engaged in designing road vehicles for use as stage coaches in England.

The condition appeared to be so serious to the conservatives, the horse owners and other elements of the kingdom who were opposed to the introduction of road transportation innovations of any kind, that Parliament yielded and laws allowing the toll-gate keepers to collect absurdly large fees from the steam coach operators were not disturbed and virtually fostered a peculiarly unjust discrimination against the power wagons.

Dance gave it up and suspended the operations of his coaches, while Gurney petitioned Parliament for relief without result and he too surrendered to the inevitable.

Gurney's engine was a useful, scientifically constructed piece of work and performed much better than any of its predecessors.

Walter Hancock, native of Marlborough, England, and a contemporary of Gurney and Dance, built his first steam carriage sometime before 1831, but it was not until February of that year that it was put into commercial operation. It was called the Infant and made regular trips between London and Stratford. In 1832 he built and operated another car, named the Era and delivered it to a concern called the Brighton Steam Carriage Company. The Era ran between London and Greenwich. In 1833 he built another, larger car.

Hancock ran the Infant from Stratford to London and thence to Brighton in 1832, carrying eleven passengers and attaining an average speed of 9 miles an hour for considerable distances and reached

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a maximum speed of 17 miles an hour. In 1833 he made a run to Brighton at an average of 12 miles an hour for the whole trip.

In 1836, Hancock ran all his carriages on regular route over the Stratford and Islington roads for five months, making over 700 trips; covering over 4000 miles and carrying over 12,000 passengers.

He should be given the distinction of making the first pleasure automobile in the world for he manufactured for himself a steam phaëton which was equipped with seats for three persons and used it extensively about London.

He built ten carriages, all of which were more or less successful.

His contribution to the art was quitè extensive, but the principal factor, undoubtedly, was his improvement of the tubular boiler. While his boiler was open to many of the objections made against all steamers of his day and before, particularly to those charging the use of too much water and the attendant disadvantages involved in frequent stops for supplies, or extravagant provisions for carrying excessive supplies, it was not as wasteful in some respects as the others. Hancock should be credited with the first use of chains in the final drive of several of his cars.

The application of the power was excellent and the running parts of the cars were well made and comparatively efficient. Like all the rest of the early automobiles, the product of Hancock required the services of a fireman and even at 12 miles an hour, the cars must have cut up the roads to a considerable extent.

The bucolic authorities certainly took full advantage of the road damage done by the cars to make the introduction of more steam cars impossible as well as to suppress those already in existence, before 1840.

Other steam cars of British invention that preceded the legal difficulties were made by Summers & Ogle. Summers swore before the Select Committee of the House of Commons that he frequently had been able to make 30 miles an hour in one of these cars, which was mounted on three wheels and weighed 6000 pounds. This car had passenger accommodations for sixteen. Mr. Summers failed to say for what distance his car made that remarkably high rate of speed; whether he had passengers aboard, or whether anybody was looking. Likewise he failed to tell how he knew the car was traveling so fast.

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The Summers & Ogle car had driving wheels, 6 feet in diameter and its vertical water-tube boiler worked with a safety-valve load of 247 pounds of steam to the square inch. The carriage was built and operated in 1831.

Still another early coach was built by Maceroni and Squires in 1834, the chief claim for which was that it ran over 1700 miles without noteworthy adjustments or repairs.

From the foregoing two examples it will be seen that even thus early in the automobile industry, certain illustrious manufacturers had already laid down a few broad principles in publicity for the guidance of those who were to come after.

Thirty miles an hour and 1700 miles without repairs!! It sounds something like the claims made for certain gasoline automobiles that were being pressed to market in 1905.

F. Hills of Deptford made a coach in 1840 that proved to be a powerful and fairly satisfactory vehicle. Hills patented the differential gear and also took out a patent on a two-speed lathe back gear. Neither of these elements were used by him in his coach. Hills made 128 miles over hilly country roads in a single day.

From 1831 forward, the British inventors and builders, as well as the operators of steam carriages, worked under heavy disadvantages. There was a furious opposition to the motor-propelled vehicle and when Parliament let down the bars that had protected the automobile users, the ordinary charges for horse-drawn carriages were multiplied by ten to the detriment of the steamers.

Where the ordinary toll charge for a span of horses and carriage was four shillings or about $1, it was raised to two-pounds or $10 for an automobile. In some cases it was worse than that in its discrimination, but as a general thing the toll-gate men charged about ten times as much for a steam automobile as they did for a horse drawn wagon.

At this period the inventors had completely anticipated the main principles of modern steam automobiles and had put them into practice. Except for improvements in boilers and condensers there was mighty little left to learn about the basic principles of the steam automobile when Hancock, Gurney and Hills surrendered. In a still broader view, it may be said that one reason why more automobile patents have not been sustained in the courts since 1900 is that

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the art as disclosed and practiced by these pioneers barred many a claim for novelty in invention, even when the motive power was gasoline instead of steam.

Of course, there was much left to be desired in the service given by the cars of 1820–1840. They lacked detailed refinements and it is doubtful if any of them performed steady, continuous work in a satisfactory manner. Occasionally they did and it is the record of those occasional performances that has come down to the present day, rather than the average performance.

What would be considered a serious delay to-day, was probably passed off as an incident in 1830.

At any rate the art died to nothing as soon as it was realized that an unjust and prohibitive tax had been placed upon road operation. The inventors gradually gave up the fight and as no new ones took their places, the machines one by one dropped out of service and soon disappeared completely. Of all that early art, not a particle remains to-day, except the records of the British patent office and the literature of the period touching upon it.

In France the progress made from 1769, when Cugnot's car was tested, to 1828, when Pecqueur invented the differential, was small. There were numerous attempts but little accomplishment. France was in a state of political turmoil during a good part of this period and the attention given to settling her questions of government probably prevented as much concentration on the automobile as would otherwise have been given.

In this country there was absolutely no progress made between the time of the Evans boat vehicle in 1804 for twenty years. There was some experimentation but nothing in the way of results.

In 1825, however, Thomas Blanchard, an inventor, engaged in installing wood and metal turning lathes of his invention, in the armories of the United States, turned his attention toward devising a road vehicle and produced in that year the first real American automobile. He built his car at Springfield, Mass., and its tests and trials proved that it ought to be ranked with the best automobiles built up to that time. It was very handy and showed itself to be a good hill-climber. Blanchard secured a patent on the car but he too was far ahead of the demand, and after securing the endorsement of the Massachusetts Legislature, he learned that while his car was good, nobody wanted it.

William T. James of New York was the first engineer to build

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CHARLES E. DURYEA
Inventor and builder of first American gasoline automobile that actually ran.

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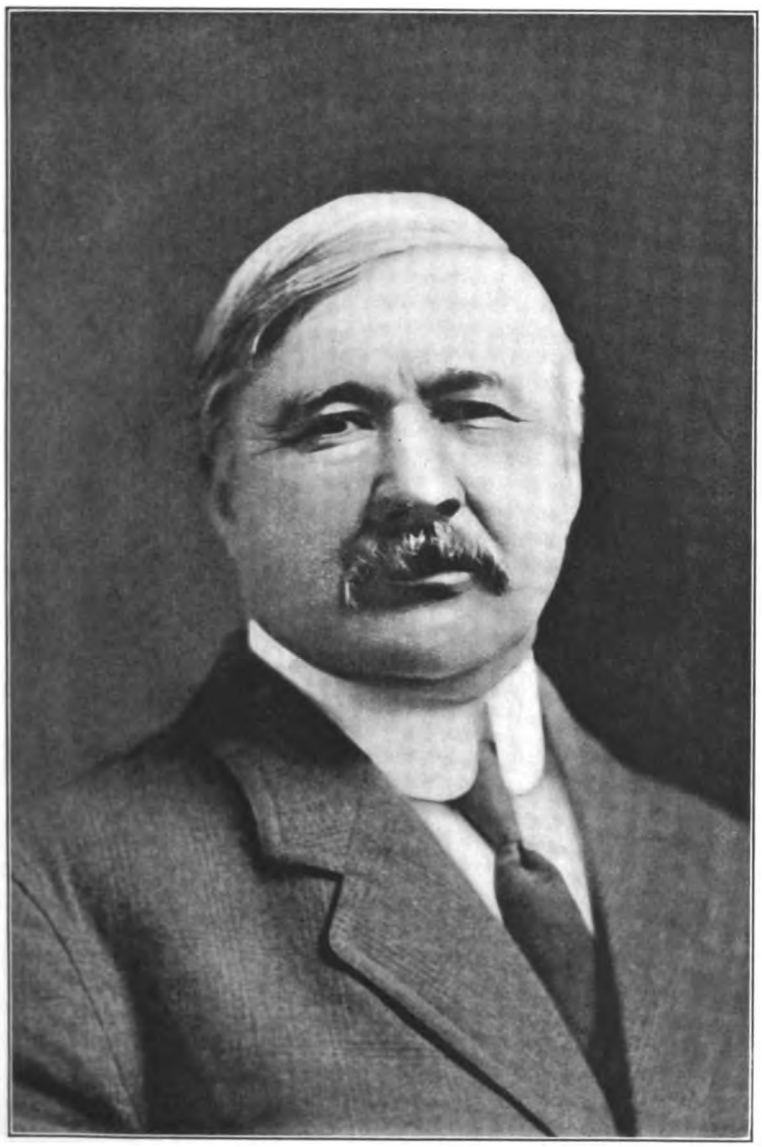

ELWOOD HAYNES

Builder of first American automobile to depart from "Horseless Carriage" form 1894. Noted as metallurgist, discoverer and inventor. President Haynes Automobile Company.

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ALEXANDER WINTON

President of the Winton Motor Car Company. Sold first American gasoline automobile.

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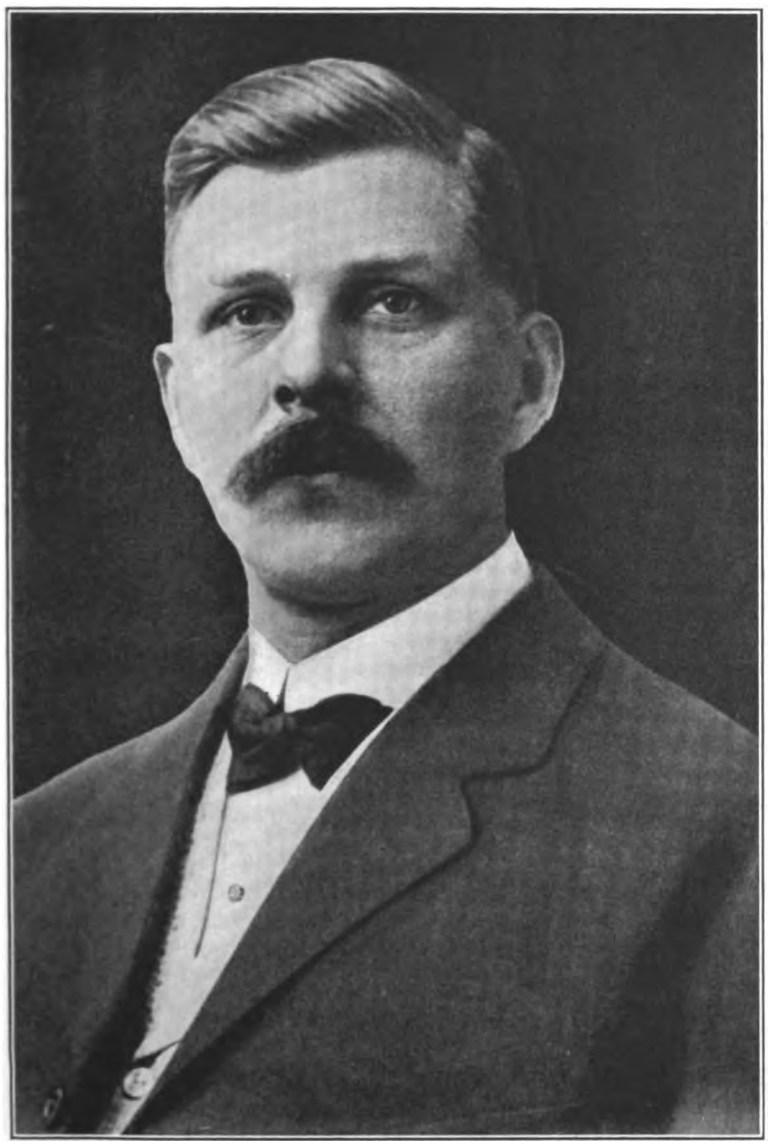

RANSOM E. OLDS
Schoolmaster of the Automobile Industry.
President Reo Motor Car Company.

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more than one car in this country. In 1829, he built a two-cylinder car for passenger traffic that made good time on the streets and roads of New York City. The engine was of the reciprocating type but its action did not satisfy the inventor and later in the year he adopted the rotary principle.

In 1830, he built a three-wheeled vehicle, driving from the two rear wheels and in the following year entered the competition framed by the Baltimore & Ohio Railroad Company in an effort to produce a better locomotive. The James engine did not win the prize, but it was so interesting to the railroad men from a mechanical point of view that he was offered favorable terms by the company to continue his experimentation.

While the influence of James on modern practice has been small in the evolution of the automobile, he and several others who probably would have built some serviceable automobiles if they had kept at it, found railroad service afforded a smart and constant demand on their ingenuity, while effort spent in making vehicles for the road had little to recommend it to the practical man at that time.

James and the group of engineers referred to were kept busy improving the railroad locomotive to the exclusion of experimentation on the road engine.

It was 1840 before the next well defined road vehicle was produced in the United States, when J. K. Fisher of New York built a small steam carriage, which in mechanics and also appearance resembled a locomotive of the period. Fisher built another car in 1853 which proved to be so sturdy that it ran for 2 years or more, sometimes attaining a speed of 15 miles per hour and often making 12 miles per hour. He also made a number of experimental engines, in some of which he developed the idea of establishing parallel connections between the crankshaft and the driving axle.

Richard Dudgeon, another New York engineer, built an automobile in 1857 which performed well on the common roads. This car burned up when the Crystal Palace was destroyed by fire in 1858. Dudgeon built another about 1859 which dropped out of view and was not rediscovered until about 1903, when it was found in a barn near Manhasset, L. I., where it had been stored years before and forgotten. Out of curiosity, the veteran was cleaned and put in running condition and actually developed about 10 miles an hour.

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Up to 1860 there had been sixty different inventors who had made cars that ran anywhere from one revolution of the drive wheels to hundreds of miles.

From 1860 to 1880 the art of the automobile lay dormant. Of course, inventors devised cars once in a while in the United States, England, France and elsewhere, but whatever advancement was made, was in the direction of slow-moving steam tractors. The term "dormant" is used in the sense of accomplishment in automobile production. The cars that were built and shown at national and international expositions were not radically better than those that had been constructed and used in 1830. Mechanical refinements were introduced, it is true, but the period was decidedly barren of real results.

Jean Joseph Etienne Lenoir opened up a new line of thought in 1863 when he invented a motor of the non-compression type, using ordinary street gas for fuel. It has been stated that Lenoir actually drove this car on one short experimental run in Paris. It must have been quite a feat to carry enough street gas in tanks to run the car very far and as there was no gasoline in France in 1863, there has been a disposition to discount the service of Lenoir. This, however, would be unjust, for the facts seem to be pretty well authenticated that the car actually ran some distance, at least.

Amadèe Bollèe, Le Mans, France, built a steam car in 1875, having applied for patent 2 years before. Bollèe was a distinguished engineer and his car, a steam stage with passenger accommodations for numerous persons, was given many practical tests in and about Paris. In 1878, he built another car which was run from Paris to Vienna, developing a maximum speed of 22 miles an hour. In 1880 Bollèe completed still another carriage of the omnibus type, which 15 years later was entered and ran in the famous Paris-Bordeaux contest, being the only steam vehicle to complete the course.

While the period from 1860 to 1880 was barren of practical accomplishment in the actual production of automobiles, save in a very few instances, it was the richest of all periods in experimental work and discoveries that later were destined to play leading parts in the art.

For instance, gasoline became a reality in the early 60's and while nobody had conceived the idea of applying it to motors as fuel, until several years had passed, the fact of its discovery is really fundamental.

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Sir David Salomons of London, built a small carriage which was driven by an electric battery for a short time in 1874.

Gottleib Daimler and Carl Benz began their basic experimentation in the field of the internal-combustion, hydro-carbon motors, but more interesting than all the others was the research and practice that led to the filing of an application for a patent, covering the use of the gasoline motor as the propelling force of a road vehicle and upon the vehicle as a whole, by George Baldwin Selden of Rochester, N. Y. This application was filed May 8, 1879 and was the pioneer patent of the industry.

Selden's device was passed upon by the United States courts on several occasions. It was upheld on demurrer in the original suit filed under it against the Winton Motor Carriage Company in 1900. It was upheld in the United States District Court, Southern District of New York in a suit filed against the Ford Motor Company and some of its agents and customers. On appeal from this action to the United States Circuit Court of Appeals, the patent itself was again upheld, but the defendants were held to be guiltless of infringement, due to the fact that the patent was construed to cover a different type of motor than the one used by them.

Selden's patent, however, was pronounced by the court to be the pioneer.

A complete account of Selden's patent; his service and the litigation under the patent, one of the most spectacular and important landmarks in the development of the industry, will be found in another section of this work.

It has been the fashion for several years to belittle the work of Selden and to deny to him the honors that he rightfully won, even though the courts took all the potency out of his patent, by injecting into the question the temperamental faults of the inventor and other extraneous matters. Selden is a peculiar old gentleman, being no different in that respect from the general run of geniuses. His tongue is sharp, for he feels that he has been unjustly and scantily rewarded. But that drawback should not rob him of the credit for what he did.

His patent claims cover the modern automobile in all but one particular. They were filed in 1879, before any automobile was ever driven by an internal combustion motor. They failed of full equitable enforcement probably because of an entry in the inventor's diary,

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made subsequently to the filing of his application, but after the art of Daimler in the field of the four-cycle engine had been developed to the point where the Otto engine had been accepted as an accomplished fact in stationary work. It was shown in court that Selden had commented adversely, or contemptuously on the work of the German master and it is therefore assumed that the court considered that Selden himself being cognizant of the work of Brayton, an American pioneer, had intended the use of the Brayton type of motor rather than the four-cycle type. From the reading of the patent itself it would seem that both styles of motors could be construed to be included in the claims.

Selden built no car under his patent until years after the patent had issued, but he did build a motor that ran in satisfactory experimental style in Rochester. The patent was issued November 5, 1895. At the time the patent application was filed, no automobile, driven by internal combustion hydro-carbon motor, was running or had ever run, despite the fragmentary claims of various alleged inventors.

Up to 1880 the only motive power of any moment that had been harnessed to the use of road vehicles was steam and the 1878 car of Bollèe marked the maximum of efficiency attained so far in the art. It was a scientific application of the wisdom accumulated during a century and improved by the facile brain of Bollèe. His 1880 car must have had an extraordinary amount of sturdiness and stability, for it was this identical car, with a few adjustments and modifications, that competed in the Bordeaux race in 1895. As a kind of measure of this situation it would be hard to imagine a car built in 1900, taking a successful part in the Vanderbilt Cup race of 1915, for instance!

The Lenoir gas-engine carriage of Paris and the work of Daimler, Brayton, Benz and Selden, were the really important things that developed in the field of the power vehicle.

However, it was during the 70's that the bicycle was introduced as a commercial factor.

The influence of the bicycle on road improvement all over the world can hardly be overstated. Up to 1876 there was not a single considerable stretch of good road in the United States outside the large cities. Travel by road in the country, while possible, as a general thing, was not certain from one week to another. A hard rain or a week of hot, dry weather rendered most roads either uncomfortable as a means of travel, or very slow at best. The coming

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of the bicycle caused a psychological change in the minds of people It brought them into contact with nature in the open air and, by giving them a taste, stimulated their appetites for a full meal.

The bicycle allowed persons to travel several times as far as was possible on their legs with a similar expenditure of energy. It imparted a new and delightful way of exercising. It improved the muscles of mankind and made riders expand their lungs.

Of course, particularly in the early days of the bicycle, it was generally limited to use in cities, or at least to localities where there were passable roads. In 1880 the demand for good roads was voiced wherever the bicycle was used, and a response to this cry was to be heard in the concessions made in starting the building of bicycle roads or paths in some sections of the country. It was an exceedingly rare thing in 1880 for a bicyclist to make what later became so common, a Century Run, or a trip of 100 miles in one day, but the desire for the open air and the open country had been born in the minds of a larger and different class than had ever used the roads extensively before, as became progressively manifest from that time forward.

The principal effect of the bicycle was educational and stimulative in preparing the world for the automobile.

The period from 1880 to 1890 saw the birth of the modern motor car in its gasoline phase.

Carl Benz, of Mannheim, Germany, built the first road vehicle to be propelled by an internal-combustion, hydro-carbon motor in 1885, and ran it repeatedly on the streets of Mannheim. He was issued a patent on the vehicle in 1886, and his concern, which was later converted from a partnership to a corporation, has been producing automobiles ever since. The first Benz car was a tricycle, equipped with a single-cylinder, four-cycle, water-cooled motor using electric ignition and a mechanical carburetor, and developed almost ten miles per hour on the streets of Mannheim. Benz was given a taste of the prejudice that appears to have been worldwide against anything in the way of a road vehicle that did not depend on horse power. He was limited by city ordinance to the use of certain streets during certain hours of the day on account of the effect his tricycle exerted on the nerves of horses and their drivers, mostly the latter.

His first important work was in the perfection and manufacture, on a commercial basis, of the two-cycle type of stationary gasoline engine. This proved to be quite successful, but when it came to the

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idea of a road vehicle, Benz adopted the four-cycle type of engine developed by Dr. N. A. Otto in 1876. He built another car in 1886 and several between that date and 1889. In 1888 he exhibited vehicles at the Munich exposition; one was shown at Paris that had been built under license granted by Benz, but actually constructed by Panhard & Levassor.

The first car ever imported into the United States was the Benz car, shown at the World's Fair at Chicago in 1893.

The transition from the tricycle form to the four-wheeled vehicle was simple and obvious, because a tricycle requires three smooth spaces of road, while the four-wheeled vehicle can get along with only two. In a world where good roads were rare and horse traffic common, there were generally two fairly passable tracks where the wheels of the horse vehicles ran, but in between these tracks Dobbin's shoes cut up the surface until it afforded anything but a smooth track for the middle wheel of the tricycle.

Steering the Benz tricycle must have been quite a job, if we may judge of it by the trials that marked the use of American motor tricycles 25 years afterward. It is quite conceivable that if some day in the distant future, when roads are uniformly surfaced with hard material, the tricycle is tried again, it may prove to be more successful, for there are certain attractive features about it that make a strong appeal. But until Dobbin is permanently out of the way there is no use thinking about such a thing.

Gottlieb Daimler produced the first motorcycle in 1885 at Cannstadt, near Stuttgart, Germany. This inventor and engineer had been engaged continuously in studying the gas engine problem since 1872 and for ten years after that date was connected with the concern popularly known as the Otto Gas Engine Works. The early part of his study and practice was in the line of stationary engines, but about 1882 he began to devote his entire time to the solution of the problem of reducing weight and increasing power in the existing engines of those days, so as to make their application to the road vehicle possible and then efficient.

His invention of hot-tube ignition in 1883 was the turning point in his career. The ignition system used in most hydro-carbon engines prior to that time was by flame. Daimler's invention made it possible to increase the speed of his motor away beyond anything that had been achieved in that direction with flame ignition, because it was

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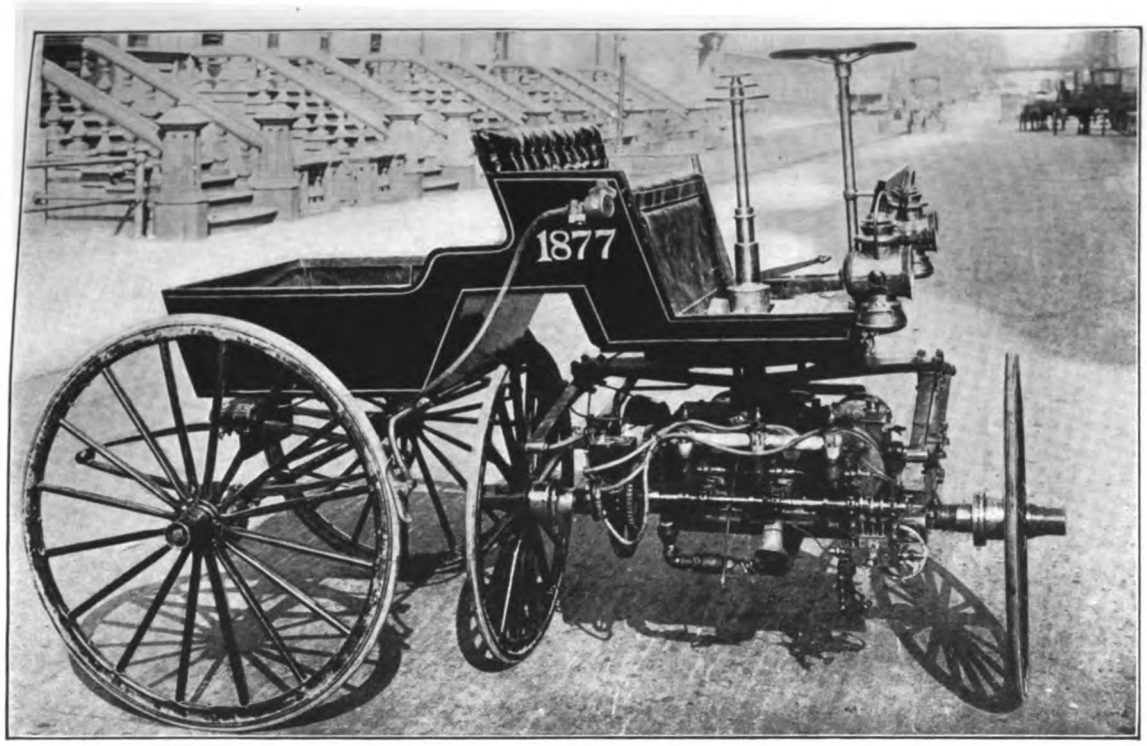

THE FIRST SELDEN CAR

This automobile was built in accordance with the claims and specifications of Selden's patent. The picture shows electric ignition, however, while Selden specified flame ignition. It contained some of the original parts of the inventor's experimental motor.

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THE MORRIS & SALOM "ELECTROBAT"

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HENRY FORD IN CAR FIRST RUN IN 1893

This was the second gasoline automobile

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THE MUELLER-BENZ, THE FIRST IMPORTED AUTOMOBILE

This car competed with Duryea in the first road race

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found that by regulating the heat of the tube the firing of the compressed charge of hydro-carbon vapor could be accomplished at any desired point in the cycle, practically by automatic action. The increased speed gained in this way served to allow a radical reduction in weight and size of the motor.

The solid foundation for Daimler's idea was definitely proven in 1885, when he installed one of his little motors on a bicycle and it proved entirely successful from an experimental point of view. This motorcycle was put into action November 10, 1885, at Cannstadt. In 1886 Daimler perfected some of the details of his motor and it immediately attracted the attention of the leading engineers of France of that period. Peugeot first acquired the rights for the Daimler motor in France, but soon after Levassor, the mechanical head of Panhard & Levassor, succeeded to the license for his company, and made and installed several of the motors in boats, one of which was shown in 1887 in Paris.

William Maybach, an engineer who was associated with Daimler, introduced numerous detailed improvements that played a constructive part in the development of the automobile. Maybach was an inventor of much merit and his designing of the aspirating carburetor and improvements of the disconnecting mechanism and gearset were among the real forward steps taken in his time.

Daimler formed the company known to-day as the Daimler Motoren Gesellschaft, which has manufactured the celebrated Mercedes cars and their predecessors since the middle 90's.

Panhard & Levassor were the first real manufacturers to take up the motor vehicle on a commercial scale. With their broad license from Daimler to make and use his motor, the French firm began to build automobiles. One or more experimental cars were turned out each year from 1889, but it was not until 1893 that Panhard & Levassor began to build cars for market. In the following year this company made 350 motors before July, 90 of which had been installed in automobiles and nearly all of which had been sold. Peugeot had taken delivery of 80 motors for installation in cars of his manufacture at that date, and it may be said that the automobile finally had been launched.

The Paris-Rouen race, about 80 miles, run under the auspices of the *Petit Journal* of Paris, was the first racing competition of automobiles in the world. It was run in July, 1894, and had an entry list

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of 46 cars. Of these 12 were steamers. The first prize was awarded to the Panhard & Levassor and Peugeot entries, which split the purse of $1,000. A De Dion-Bouton steam tractor was next in the honor list. There were fifteen cars reported as completing the course, four of which were Panhards and four Peugeots, all eight being equipped with the Daimler 3½ horsepower motor.

Daimler was the first to adopt the idea of the V-shaped motor, so widely incorporated in modern manufacture, although he used only an angle of 15 degrees in his two-cylinder engines, whereas the eight and twelve cylinder engines of 1915 use 60 and 90 degrees.

Before leaving the 1880-1890 period, reference must be made to the work of Leon Serpollet and the fundamental accomplishments of Count A. De Dion and G. Bouton.

Bouton devised and manufactured a steam tricycle in 1884 that marked a distinct step in efficiency of steam locomotion and in 1885 made a four-wheeled vehicle embodying the same principles in improved form. After Count De Dion joined forces with Bouton, they took first place in the manufacture of steam vehicles, corresponding in this respect to the position of Panhard & Levassor in gasoline automobile manufacture ten years later. De Dion & Bouton placed the steam automobile on the market of the world.

Ten years later this concern entered the field of gasoline automobile manufacture, and has borne a progressive part in the industry ever since.

De Dion-Bouton influence on the trend of development has been largely exerted in the direction of the very excellent type of motor-bus that is to be seen on Fifth Avenue, New York, and elsewhere, and in the perfection of the V-shaped eight-cylinder motor recently introduced into American practice.

Leon Serpollet focused a large amount of attention upon himself and his work in France and elsewhere in the later 80's by his invention of what is termed the flash-boiler. This made possible the use of dry or super-heated steam and opened a new era in the field of the steam automobile. Through Serpollet's genius it became possible to use much higher pressures, reduce weight and increase water economy. His first car, a tricycle, was built in 1887. Serpollet's contribution to the art was really a rediscovery, for the British experimenters of 50 years before had tried out the idea of making the metal of the boiler store up the heat for use in producing steam. Serpollet, to be

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CHARLES E. DURYEA IN TIMES-HERALD ROAD RACE WINNER

This car looked like the first car built in 1891-92

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sure, improved the details and produced an efficient engine which did have a distinct effect upon the art.

When 1890 dawned there were just two things necessary to make the experimental cars of that period modern, serviceable automobiles in every sense of the word.

Motors, running gear, transmission, ignition and surface carburetors had been developed to a point where they would all return service. The cars would have appeared a little strange to the modern eye, but in their essential principles they were soundly based.

England was a desert so far as progress was concerned, the remarkable law that had been placed upon the statute books, practically prohibiting the roads to any kind of traffic that did not contemplate the use of flesh and blood as motive power, being still in force.

American invention was dormant. Selden could not get any of our so-called alert business men to finance the building of a model of his machine, and while more or less learned references to the condition of the automobile art in France were made from time to time in the deliberations of the scientific and engineering societies, not a wheel was turned to adapt the art to American conditions.

As a matter of fact, there was a wide prejudice in this country against even trying to improve on animal transportation on the roads, due to the fact that we had some 20,000,000 horses capable of more or less service.

About the utmost that can be said for the American inventors and engineers at this period is that they were experimenting, without much hope of producing improvement.

What the automobile lacked at that time was: First, pneumatic tires, and, second, some improvement by which the placing of the motor on the axle or elsewhere where it was subjected to the road shocks and vehicular vibration could be obviated.

The early steam cars were all more or less efficient mechanically, but lacked strength and sturdiness. They jarred themselves to pieces in a comparatively short time after being put into service. Of course, the materials used in the early cars did not compare in quality with those of to-day. Heat treatment and alloys were little used at first in the preparation of the steels destined for the trial cars, and perhaps if the first attempts to build automobiles had had the advantage of modern materials and had been carried out with the mechanical precision of modern times, they would have lasted longer than they did.

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But, fundamentally, the difficulty lay in excessive vibration and road shock.

The discovery of the process for vulcanizing rubber, the application of the process to solid tires for horse-vehicles and later for automobiles, and finally the evolution of the pneumatic tire, solved the first part of the problem.

The development of the art by Levassor, of Panhard & Levassor, furnished the second essential, when the idea of a central frame to carry the power plant and act as the keystone of the car structure was produced.

Thus, when the first American gasoline car came along it required practically nothing in the way of inventive genius. Selden did not instruct the American art. His wisdom was locked up in the secret archives of the Patent Office until long after the first real cars were running. But the early American builders had from Europe the fullest sort of data on every particular of the automobile that has since been held to be essential.

No credit should be subtracted from the achievement of Charles E. Duryea and his brother Frank, in building the first American gasoline automobile that would run. Duryea's feat was epochal, even if his car was not, as subsequent practice seems to have demonstrated. He started to build five cars prior to 1895 and completed one in such excellent shape that it proved to be one of the two contestants that toed the scratch at the starting signal for the first automobile race ever run in this country, the *Times-Herald* road race from Chicago to Waukegan, Ill., and return, Thanksgiving Day, 1895.

The inventor is a man of charming personality and much tenacity of purpose. He called his car the "Buggyaut" and he has clung to the style and type of his original car to this day, despite the discouraging attitude assumed toward it by the public. He manufactured three-wheeled cars early in the commercial industry that performed well for their type.

But Duryea never progressed beyond the scope of his original idea. To be sure, he perfected some of the details of his first cars, but if the art of road transportation had depended upon his development, it would have stopped with the Buggyaut and his excellent form of the motor tricycle.

It was the very temperamental angle of Duryea that stood in the way of his reaping the great material rewards that was at the founda-

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tion of his production of the first American car. It required a "single-track" mind to carry out the pioneer work. Duryea, with his power and insistence and fully grounded belief in the automobile, was just the man to put through the idea.

In that day the United States was not ready for the car. Of course, we had no roads to speak of and, save for a kind of widespread curiosity, there was no public interest on the part of the masses. And so due credit must be given to him for his courage and dogged insistence on giving the people something that he knew would be good for them, but which they were quite as positive they did not want, as any small boy is about a dose of castor oil.

Duryea gave them the dose of castor oil, but he wanted to continue the treatment from that day forth forevermore.

Henry Ford's first car was run in the Spring of 1893.

Elwood Haynes, of Kokomo, Ind., practically completed his first car in 1893, but did not get it before the public quite as soon as Duryea. He was a contemporary, but slightly anticipated by the pioneer and Henry Ford. The exact date upon which the cars first ran is disputed, but the weight of the evidence favors the Duryea claim that his was first in 1892, Ford second in 1893 and Haynes third in 1894.

In 1896 there were but four gasoline automobiles in the United States; the Duryea, Ford and Haynes, American cars, and the imported Benz. All four were purely experimental machines, although considerable effort was made to sell duplicates of the Duryea and Haynes. There was absolutely no market and it was not until March 24, 1898, that the first bona fide sale was consummated. Alexander Winton, who ranks almost with the pioneers, Duryea, Ford and Haynes, from the viewpoint of experimentation, sold a one-cylinder Winton automobile to Robert Allison, of Port Carbon, Pa.; received payment for it and shipped the car to Allison April 1, 1898.

Of the 3,500,000 automobiles, including the manufacturing schedules of 1916, this sale by Winton was Number 1. The fact is amply authenticated by court records of sworn testimony. Allison ran the car for about two years, and, at Winton's solicitation, sold it back to the Winton Motor Carriage Company, where it is still in existence, maintained in running order and practically as capable of delivering service as it was the day it was shipped to its purchaser.

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The story of the first sale as told by Winton deserves some space because of its importance as a landmark in the industry:

"Up to that time nobody in America had ever built for sale a horseless carriage, propelled by a gasoline motor, and consequently no American had ever bought such a product. The Winton Company did not know where its buyers were to come from, but it had faith that buyers would come. So we started to build four machines for sale. When the vehicles were almost finished there were still no buyers in sight.

"One day in March, 1898, Robert Allison, a mechanical engineer, registered at a Cleveland hotel and asked to be directed to the Winton plant. So little was known of the automobile factory at that time that the clerk could not enlighten Allison as to directions.

"But he had come to Cleveland to buy an automobile, if he could get one, and eventually he called at the works and was shown one completed car and the three others nearing completion. He asked me to give him a ride and I drove across the city, giving the first of the many million 'demonstrations' that have marked the sale of cars in this country.

"When we returned to the factory he bought the car and paid for it, and he has bought several of our cars since."

There had been several "sales" of automobiles prior to Winton's, but the evidence appears to show that they were made to officers of their respective manufacturing companies.

Marcel and Louis Renault did a large service for the development of the automobile. These Frenchmen, born at Boulogne, entered the industry rather late to be called pioneers, but their contribution was in the nature of a series of improvements on existing practice that entitles them to much consideration. In January, 1899, the Renault Brothers made a car that had a three-speed transmission gearset and final shaft-drive. In 1900 they incorporated a thermo-siphon cooling system and later adopted the characteristic form of radiator behind the motor, at the dash, that distinguishes this excellent make of automobiles.

The Renaults are entitled to much credit for their work, and but for the tragic death of Marcel Renault in the Paris-Madrid race in May, 1903, it is likely that even more progress would have been made. In this race Louis Renault reached Bordeaux first of the considerable field, having passed Marcel many miles back toward Paris, and not

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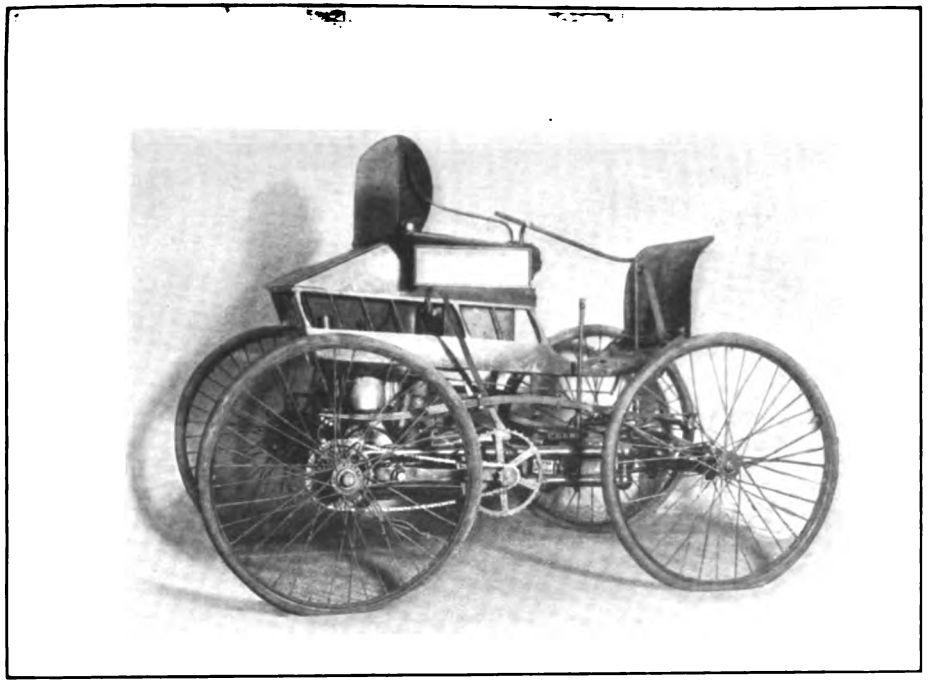

FIRST HAYNES AUTOMOBILE

This car ran July 4, 1894

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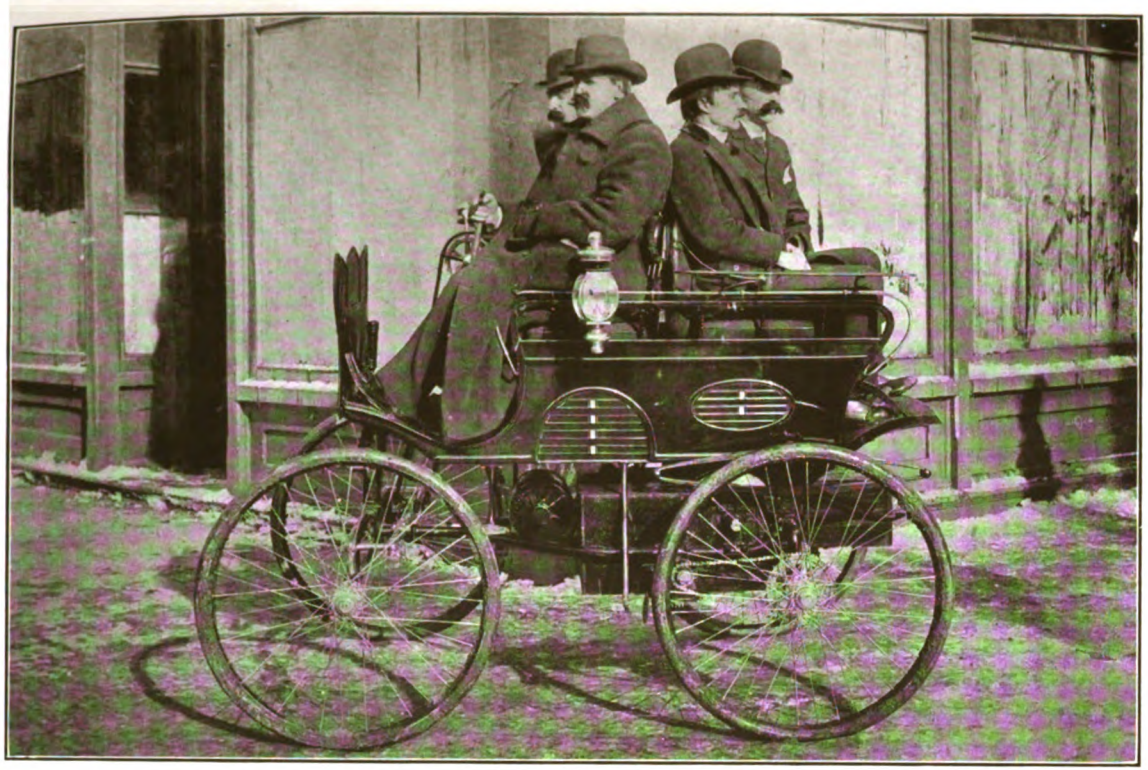

THE SECOND HAYNES CAR (1895)

From left to right: Elmer Apperson, H. A. Winter, Elwood Haynes, John D. Maxwell

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COLUMBIA OF 1898

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being closely pressed at the finish. But soon after he had received the plaudits and congratulations of the assembly, word came over the wire that Marcel Renault had met with an accident only a few miles from the goal. His car had skidded and overturned and the brilliant inventor lay crushed beneath it. The injured man was removed to a nearby hospital, where he died several days later.

The Renault French patents have been quite profitable to the company, but no very definite effort was ever made to enforce them generally. The effect of Marcel Renault's death exerted a great influence on the surviving brother and probably had much to do with the conservatism that marked the concern's career for a dozen years.

The Renaults found the automobile lacking in several mechanical details, and they supplied the deficiencies with the highest type of inventive ingenuity. The main effort of the Renaults was to improve the car, and in later years improvement took the form of making it better looking and more comfortable, after the introduction of their mechanical devices.

Great material prosperity has been the part of this company, due to the real valid inventions produced by the Renaults, but the element of tragedy supplied by the death of Marcel long served to check radical development. In a conservative way, the car has gained and held the utmost respect of a large part of motordom's richest class.

THE ELECTRIC AUTOMOBILE

It was in 1892 that the first electric vehicle was seen on the streets of Chicago. This car was designed and built by William Morrison, of Des Moines, Iowa, during the Summer of 1891, and a year later was sold by him to J. B. McDonald, president of the American Battery Company, Chicago. The *Western Electrician* of September 17, 1892, gave a description of the car and of the excitement caused by its appearance on the streets of the Western metropolis. "Ever since its arrival," said that paper, "the vehicle has attracted the greatest attention. The sight of a well-loaded carriage moving along the streets at a spanking pace with no horses in front and apparently with nothing on board to give it motion, was a sight that has been too much, even for the wide-awake Chicagoan. It is most amusing to see the crowd gather whenever the vehicle appears downtown. In a number of

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instances so great has been the curiosity of those on the streets that the owner when passing through the business section of the city has had to appeal to the police to aid him in clearing the way for his carriage."

In 1892 Fiske Warren, a prominent Bostonian, was commissioned to build an electric "brake" capable of carrying eight passengers. As a result the streets of Boston soon saw an electric vehicle which could attain a speed of 16 miles an hour, and which at the rate of eight miles an hour could cover 40 to 50 miles on a single charging of the batteries.

From 1892 the existence of the electric vehicle was an assured thing. In 1896 New England was treated to its first motor race, a feature of the State fair held at Providence, R. I. This racing meet attracted the attention of the country and in the Boston *Post* there appeared this comment: "The results of the contests Monday showed the two electric motor wagons far in the lead. On Tuesday there was one of the liveliest contests. One of Duryea's entries went to the front and it maintained the lead for half a mile, with Riker's electric wagon a close second. The entry of the Electric Carriage and Motor Company finally rushed ahead of Riker, finishing second to Duryea. Time, 2:47½."

In 1898 the Riker Electric Motor Company was organized in Brooklyn and began building electric vehicles as a commercial proposition. A little earlier Morris & Salom, of Philadelphia, began building electric brakes, hansoms and broughams for cab service in various cities, afterwards transferring their rights to the Electric Vehicle Co., of Hartford.

Meanwhile several firms engaged in the manufacture of bicycles had become interested in the promising outlook for electric automobiles. The Waverley Company, of Indianapolis, built its first electric carriage in 1897. The Pope Manufacturing Company, of Hartford, was on the market in 1897 with the Columbia electric phaeton. In 1899 the Baker Motor Vehicle Co., of Cleveland, made its debut with a very light piano-box electric runabout with bicycle wheels and chain, which through some error in computation has since been exhibited and advertised extensively as the "first electric ever built." About the same time the Woods Motor Vehicle Co., of Chicago, began building electrics as a commercial business, although its first car was made in 1893.

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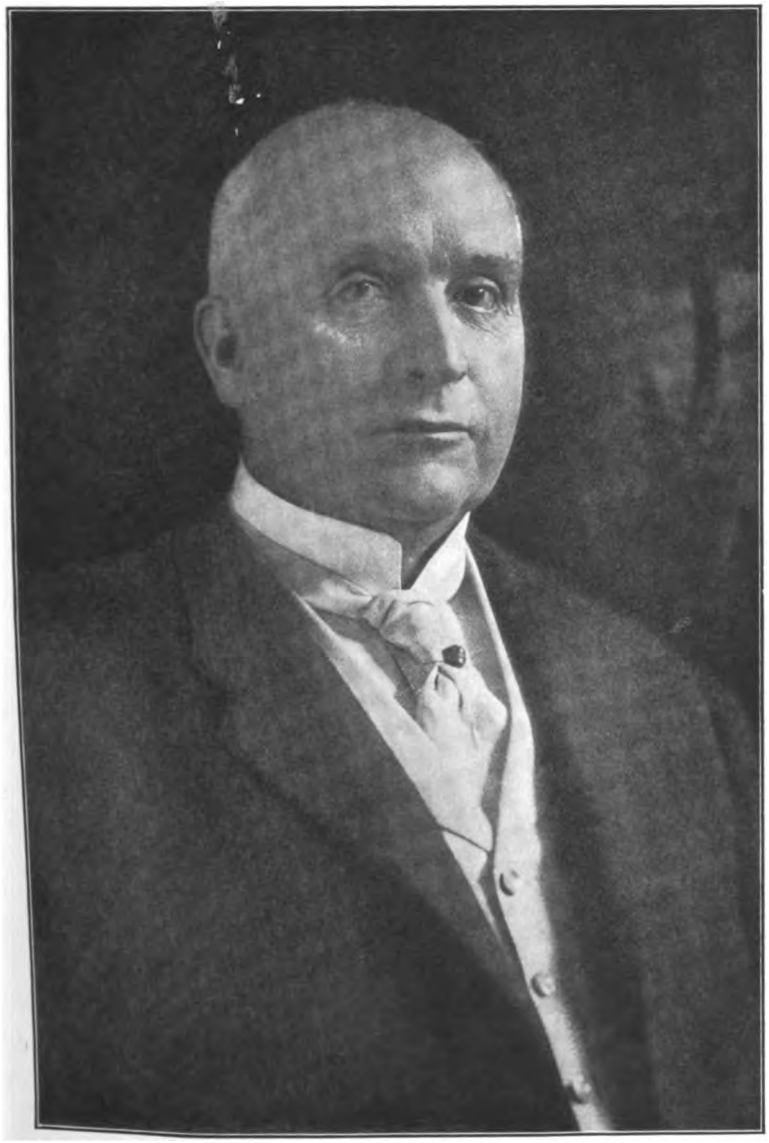

W. C. ANDERSON
President Anderson Electric Car Co.

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In 1898 Pope, Riker, Barrows and Waverley electrics were exhibited at an electric show held in Madison Square Garden New York. In the following year electrics were again exhibited at a bicycle show in the same place, and in the early Winter of 1900 they occupied more than a third of the space in the first exclusive automobile show in this country, given in the Madison Square Garden, New York, by the Automobile Club of America.

The electric automobile business was now thoroughly established and the output was increasing at such a pace that several carriage builders, including Studebaker, the Columbus Buggy Co., and Rauch & Lang, of Cleveland, were attracted into it. From year to year there has been a steady growth in the industry and a continuous development in the mechanical and electrical features of the car that has made it an increasingly important factor in the transportation business of the country.

The Detroit Electric made by the Anderson Electric Car Co. began business in 1906.

The growth of the business has never taken on boom proportions. The increase in the demand for electrics has been sufficiently moderate to be a normal and healthy growth, and it has never been stimulated by much advertising.

Several factors have contributed to this steady but conservative growth of the industry. In the first place, the electric has been kept out of racing and cross-country tours that have been the principal advertising features of the gasoline car industry. The mechanical development of the electric has proceeded on conservative lines. Shaft drives, which were adopted and abandoned by various makers at different periods, have been perfected only within the last five years by the leading manufacturers.

Motors with sufficient overload capacity to furnish the required power under all conditions of road and load have been a slow development. Controllers that would not arc under any conditions and could always be depended upon to perform the service required of them were a gradual evolution.

These facts have all had their influence upon the industry's rate of growth, and have tended to develop a conservative spirit among electric car manufacturers quite unlike the venturesome methods of some gas car makers.

It is reasonable to claim that there is no practical means of mechan-

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ical locomotion that is more highly developed or more evenly balanced in all its parts than the electric automobile itself. As a piece of mechanism it is so nearly perfect that he would be a rash prophet who would undertake to point out the direction of future improvements.

The total number of all electric cars manufactured to 1915 was upwards of 35,000.

The field of the electric commercial wagon has hardly been explored as yet. There is an immense opportunity for the use and distribution of electric motor wagons which remains to be mapped out, opened up and exploited. It is the undiscovered country of the future and the growth of that branch of industry is likely to be one of the phenomenal developments of the next few years.

Recently William P. Kennedy, for the *Electrical World,* of New York, made an investigation of the cost of maintaining electric commercial vehicles in 145 large installations totalling 8,095 trucks in some thirty different cities.

As a result of this investigation it was found that the more than 8,000 electric vehicles included in the tables are now being operated for the following average daily costs:

1/3 Ton.....$5.68	1 Ton.....$7.56	3 1/2 Ton.....$10.38
1/2 Ton..... 6.34	1 1/2 Ton..... 8.15	5 Ton..... 11.74
3/4 Ton..... 7.02	2 Ton..... 8.92	

The average daily cost of all the trucks investigated was low and many gratifying expressions were received from the owners and operators.

Within a period of ten years horse carriages have almost disappeared from the streets of the larger cities and transition from animal to mechanical transportation of merchandise is now rapidly taking place.

THE MODERN STEAM CAR

The introduction of the steam automobile to the modern market was quite as interesting as the first sale of Winton in the gasoline car field in 1898 and the authentic account of Morrison's sale of an electric in Chicago in 1893. But with regard to the steam automobiles, there was not the same degree of novelty as obtained in the other types. Aside from the fact that many kinds of steam automobiles had been

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WINDSOR T. WHITE

President White Motor Company. Pioneer in Good Roads movement.

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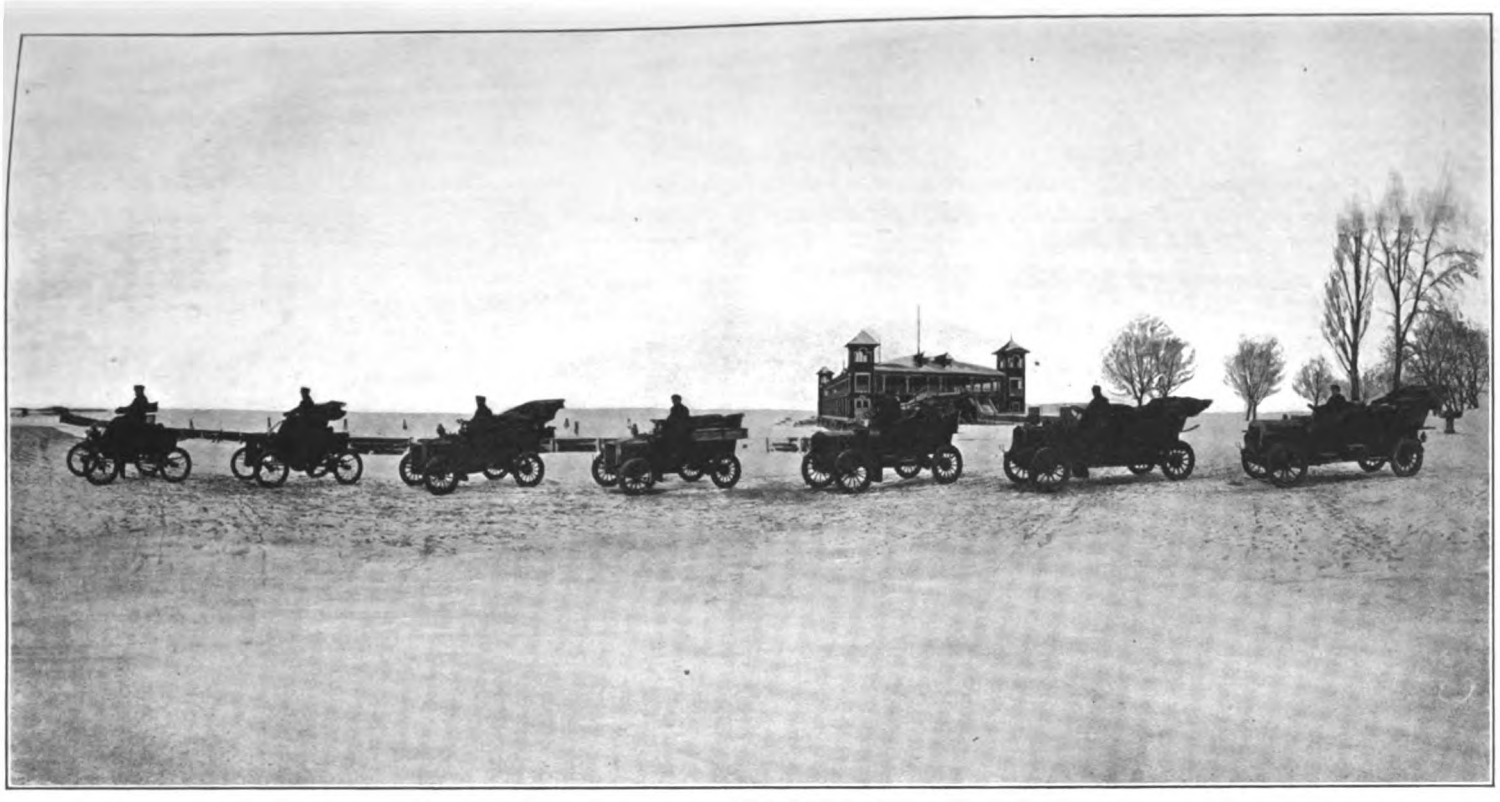

THE SEVEN TYPES OF WHITE STEAMERS MADE AND MARKETED DURING PERIOD 1901-1909

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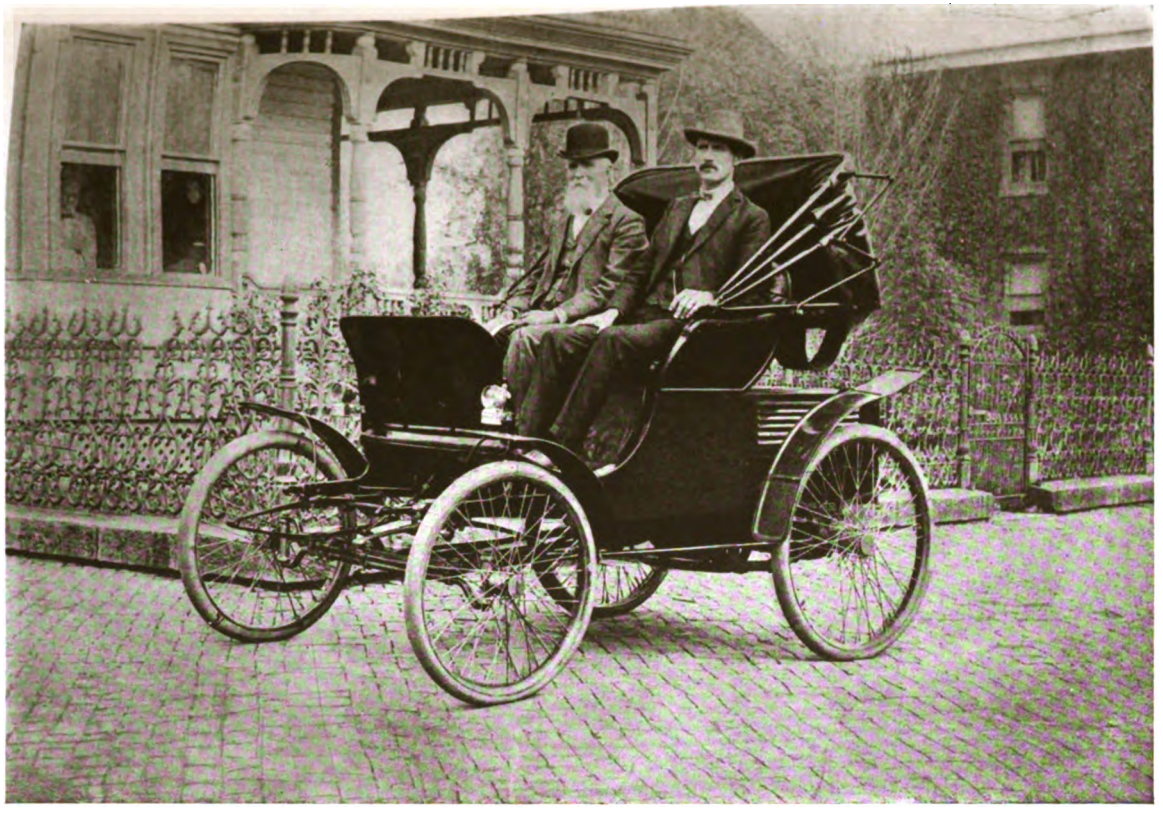

ROBERT ALLISON, OF PORT CARBON, PA.

At the steering lever of the Winton single-cylinder car which he purchased March 24, 1898. This constituted the first sale of an American built gasoline motor car

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THE FIRST AUTOMOBILE MADE BY FRANK B. STEARNS, Cleveland, Ohio.
This car is still in running order.

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THE WHITE STEAMER OF 1901

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made and run during the century before, the people of the 90's used steam railways almost daily and were acquainted with road rollers and traction engines of various types. So the application of steam to the problem of passenger transportation on the common roads was not such a violent innovation to the average person as was the adoption of gasoline or electricity.

The first modern American steam car was built by S. H. Roper, of Roxbury, Mass., and sold to a physician in 1889. The car was used by its purchaser in place of a horse-drawn carriage and was run for several years. Roper built ten steam vehicles between 1860 and 1894, including bicycles, tricycles and four-wheeled carriages. It is possible but unlikely that he sold a car before 1889. While his vehicles were reasonably efficient, they were not to be compared with De Dion-Bouton products in France and were not markedly superior to the numerous American cars built at and before his period.

There was an immense amount of effort wasted between 1860 and 1890 in the United States in the direction of freak steam vehicles, none of which had any special merit.

Roper died in 1894 after testing out a steam bicycle on a race track, where he had just succeeding in making a circuit of the track at 30 miles an hour. His death, however, was not due to accident, unless the jolting of his machine at high speed might be called an accident.

The application of steam to bicycle propulsion was the subject of numerous futile patents that have no place in automobile development. In fact, they probably had a deterrent effect upon the automobile through the expenditure of capital and effort that could have been better applied.

But with the entry of the Stanley Brothers, Whitney, Riker and others into the field, the steam automobile emerged from the chaos and confusion of the inventors who tried to adapt steam to the bicycle and they made rapid progress in mechanics and appearance as well as service delivered.

About 1900 it looked as though the steam car was going to keep pace with the gasoline automobile as a commercial factor and for several years after the beginning of this century the progress in steam automobile development was quite notable. Riker, Stanley, Whitney, Prescott, Gaeth, Lane and White did a large amount of experiment-

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ing that led to the actual production of steam automobiles for sale to the public.

In fact, the work of those American modern pioneers constitutes about all there is to the steam car art. Stanley and Whitney started off about the same time and both enjoyed a fair business in this country and both established sales agencies abroad before 1900. The Whitney car, made by C. E. Whitney, Hartford, Conn., did not continue long, but Stanley Brothers are still making their cars, and, despite the abandonment of steam as the motive power for automobiles by all others, find a progressive market for their entire output.

A. L. Riker, presiding genius of the Locomobile Company of America, was a pioneer in the steam field, as well as that of the electric automobile. He raced steamers in the early days, built numerous serviceable cars and finally abandoned steam and electricity to build gasoline cars.

Prescott never scored a commercial success in the building of steam automobiles. Lane made a few very good automobiles early in the industry, but did not persist long.

White scored by all odds the greatest success in developing the steam car, measured by commercial results. The patents granted to Rollin H. White, covering an excellent generator, and a dozen of his detailed and important elements of construction, design and application were broad and comprehensive, and their claims were so novel and apparently so well based, that a curious thing happened to the steam automobile art.

Litigation over the White patents was never extensive, but what there was of it showed that there was a solid foundation for the claims and indicated that if they were adjudicated, they would probably be sustained. There was nobody in the steam car field for the moment who felt like carrying on extensive and expensive litigation under the circumstances, and as a result, the spirit of inventiveness that might have been exerted almost as widely to improve the steam car, as it actually labored and achieved in the development of the gasoline car, was discouraged by the very excellence and breadth of the White patents.

Early in the century the steam car field narrowed to White and Stanley, while in the gasoline industry there were scores of aggressive manufacturers, advertising and pressing their product to market

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and hundreds of engineers engaged in designing and discovering detailed improvements.

The interest of the art was in the direction of the gasoline car by virtue of mere force of numbers. There was a distinct difference between the two types of automobiles that was made the subject of intense advertising campaigns, and the direct result was that the market for steam cars dwindled as it increased for the gasoline types.

The White Company began to drift toward the gasoline car in 1908. It made a considerable number of gasoline cars in 1909, and the product of 1910 was about half and half. In 1911 there were few steamers and none have been made since.

About 1907 the statement was made, apparently with the approval of the White Company, that it would willingly license several manufacturers on a liberal basis to make steam cars if they would enter the field. There was no response to the offer that was of sufficient solidity to warrant the company in carrying out its proposal.

From that moment the steam car was a dead issue as a real factor.

The steam car dropped out of consideration by being smothered by the gasoline automobile. To this day there are thousands of motorists who believe that the steam car was best. They argue that the evenness of action and delivery of power in a steam car is superior to the same things in the average gasoline automobile. They say that it is not so trying to ride all day in a steam car as it is in the average gasoline automobile, but against those claims the general public has adopted the gasoline type.

The steam car required a driver with more knowledge of mechanics than the other kind of car needed, and also proved more complicated to repair. An expert could make 200 miles a day in a good steamer without a hitch. He was not obliged to take on water every few miles and he did not burn out his boiler. A little extra care was all that was required to run a steam car, but the hurrying, intense American public would not give that extra touch as a general thing when it was not required in the operation of a gasoline car.

And so White quietly got from under and went into the gasoline automobile field, leaving Stanley as the only maker of steam automobiles, of the slightest importance, in the world.

Stanley's car always has been an excellent automobile. It was a light runabout in its earliest phase with a power plant consisting of a simple form of vertical fire-tube boiler, upon which a great deal of

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painstaking effort directed toward refinement had been exerted by the makers. This boiler gave an abundance of dry saturated steam to run the two-cylinder engine at 400 revolutions per minute, using 150 pounds pressure per square inch. There was no condenser on the first cars and as a result 20 to 25 miles was about as far as the car could be driven without taking on another supply of water.

The modern Stanley car looks very much like the approved types of gasoline automobiles and can be run indefinitely without refilling the water tank. A skillful driver can go all day without renewal of the water supply, and tests have been made by experts that have indicated a much wider radius of action on a single filling.

It was the White practice that stands out in the field of the steam automobile. During the years that the White company focused its attention on the improvement of the steam car, there was no better automobile built in the United States.

The participation of the White company in automobile work commenced in 1898, when the first drawings were made by Frank Farmer and E. W. Hewlett under the direction of Rollin H. White. After considerable experimental work, during the course of which several crude machines were turned out, the company had four serviceable, small cars on the floor in May, 1900. The cars were driven by two-cylinder engines utilizing the simple Stephenson link motion, already fully approved in practice. The boiler did not follow the lines of Serpollet with exactness and may be described as a semi-flash type with 11 water coils and forced circulation.

This car made such a success in service that the company went ahead rapidly with its development and Professor R. C. Carpenter of Cornell University, one of the most profound students of road locomotion of the period, presented an address at the meeting of the American Society of Mechanical Engineers in December, 1906, in which he described the steam plant of the White cars of current make with elaborate care and detail.

Professor Carpenter described the generator as being a single tube boiler, or continuous flow boiler, consisting of a series of horizontal coils connected so as to form a continuous tube through which all of the water fed to the boiler and all the steam discharged from the boiler had to pass.

There was no steam reservoir. The main difference between the White generator and all other boilers was that in the White device

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ELMER APPERSON

President Apperson Brothers Automobile Company. Pioneer (1894) and a continuing factor in automobile development.

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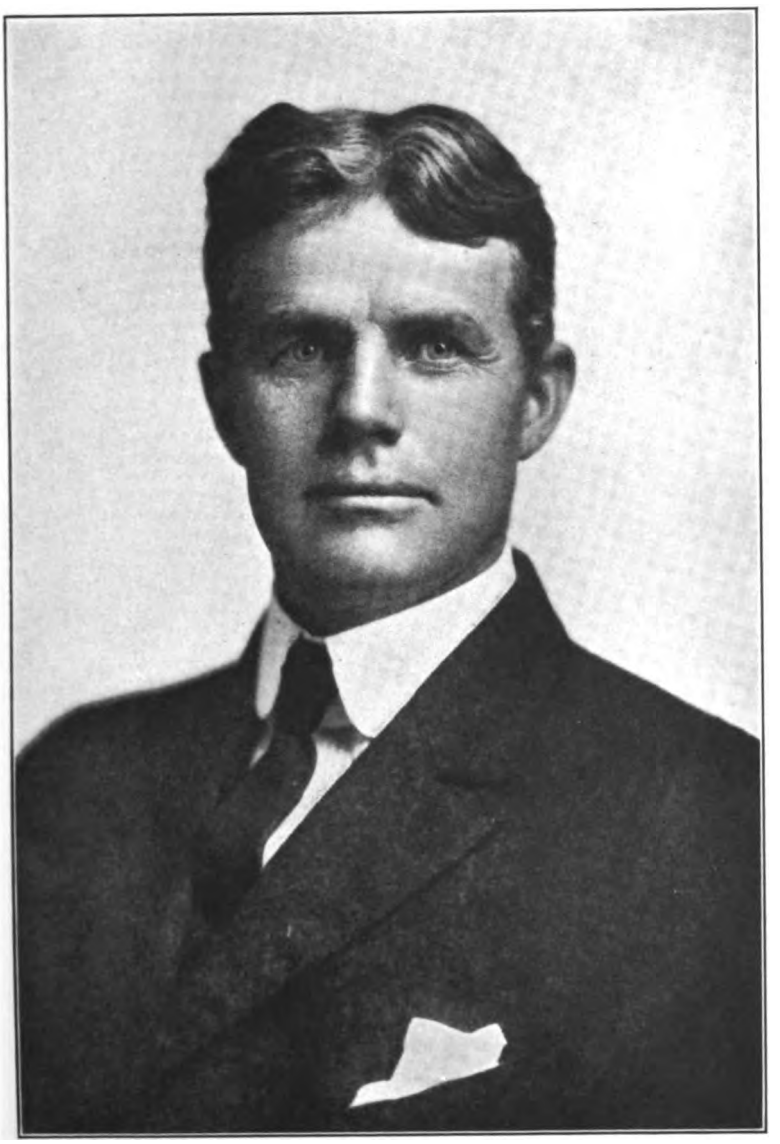

JOHN WILKINSON
Inventor and designer of the Franklin
(1898)

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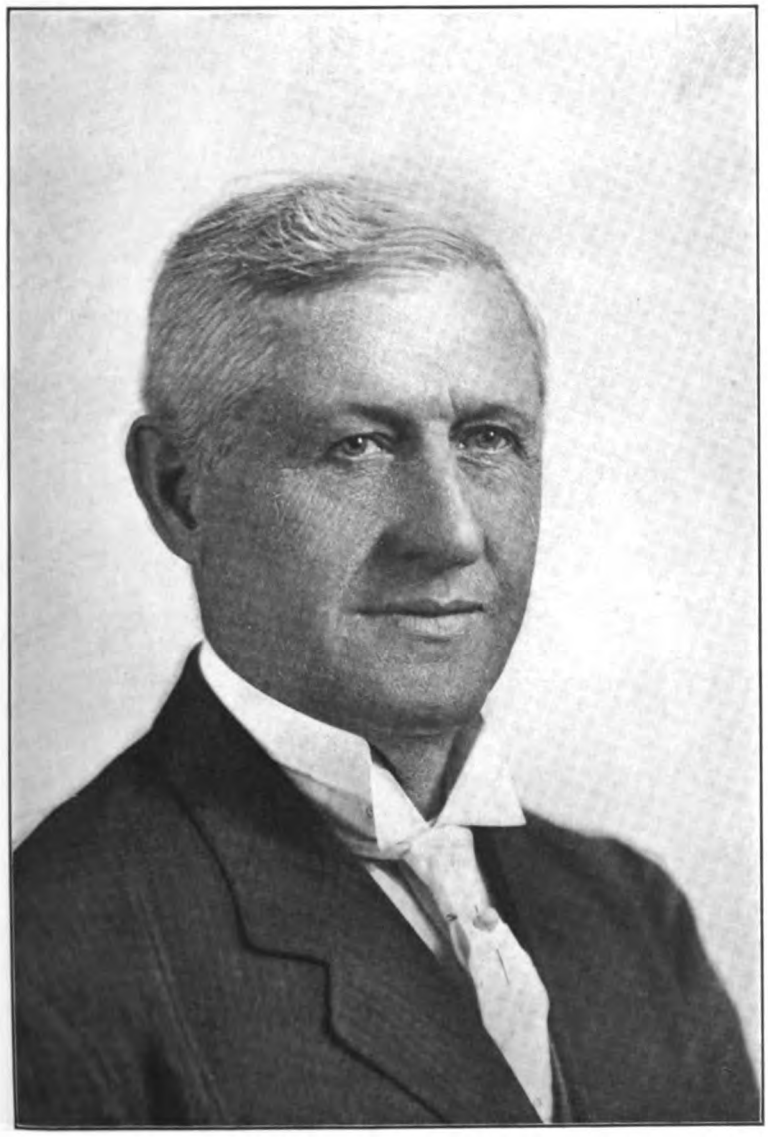

JOSEPH W. MOON
President Moon Motor Car Company

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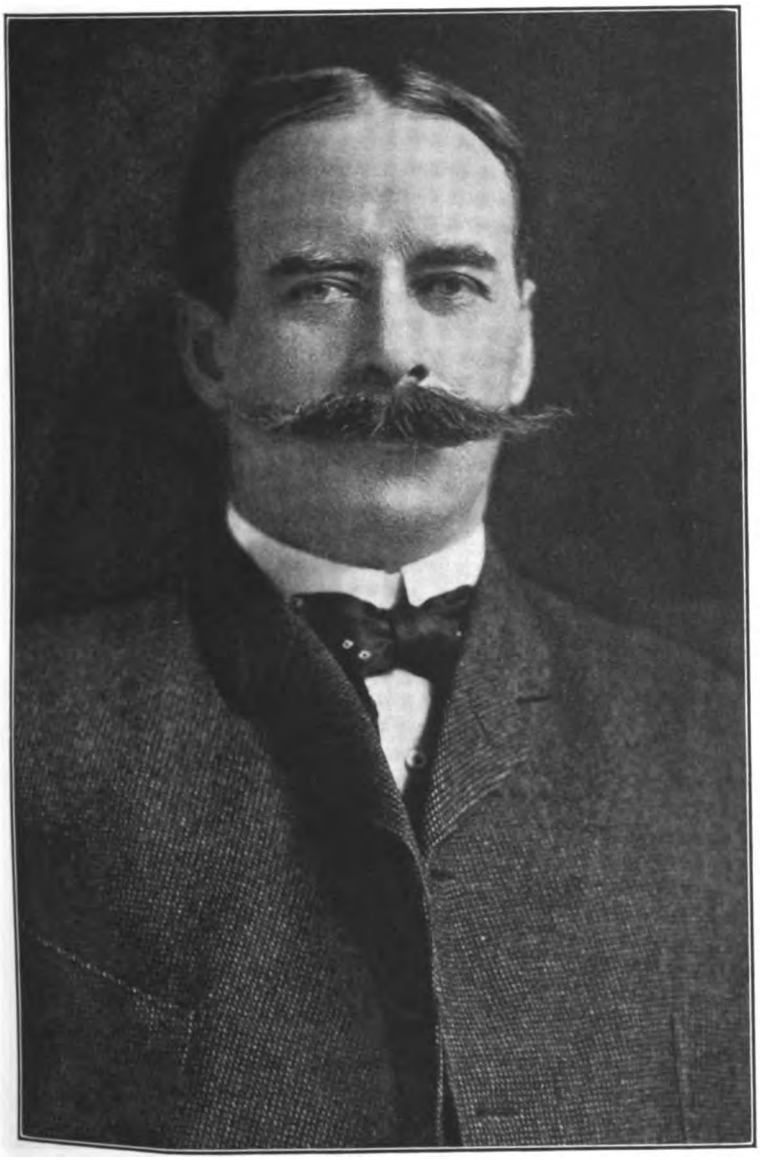

HAYDEN EAMES

Former naval officer, who played important part in the Electric Vehicle Company (1899).

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the water was kept at the top and the steam at the bottom. The water flowed down through the tube until it encountered the portion of the coil in close contact with the flame of the burner, when it was converted into steam. In passing through the great length of tubing it became much superheated, sometimes reaching a temperature of 750 degrees or more. It was delivered to the motor after coming from the last coil, which circled the burner and rendered the steam very dry and tremendously potent.

When it is realized that the safety valve was generally set at from 1,000 to 1,200 pounds pressure and that accidents in the nature of explosions were almost unknown in White practice, it becomes apparent that a high degree of engineering and workmanship had been put into the automobile. In the place of the radiator of the gasoline car, the White had a condenser into which the exhaust steam was discharged, cooled and condensed and pumped back into the water tank for use again.

There were seven models of White steamers produced during nine years of progressive development. The first were small runabouts and the last were large and powerful automobiles equipped with any style of body desired by the buyer. They were all carefully and scientifically suspended and gained an excellent reputation for giving comfortable service.

The first side-entrance tonneau in the steam car art was introduced in 1905 by the White company, and from that time on there were no limitations as to body equipment.

In the White expansion engines a high degree of economy was reached, the tests and practice showing that about as much power was delivered for fuel expended as there was in the largest varieties of triple-expansion engines.

Both steam and electric cars, however, labor under one disadvantage that does not apply to gasoline cars. Heat, of course, is the source of power and in steam and electric road locomotion it is necessary to convert the heat into one kind of power and then apply the power, as for instance the development of steam by heat and then the application of the steam to produce the power. In electricity, the current must be produced, then transferred to the battery and from thence the motor derives its power.

In the gasoline automobile the vaporized gasoline is burned in the cylinders of the motor without change. That elimination of the extra

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step makes the operation of a gasoline motor more economical of power units than either steam or electricity.

But in the early days of American industry there was no question about the production and delivery of power by the White cars. A glance through the files of the sporting and automobile press in the Fall of 1904 shows that the White company went about the creation of a demand for cars by showing what the cars would do. Pathfinding was one of the chief responsibilities shouldered by the company, and in those days the steam cars were pushed into all sorts of out-of-the-way localities in search of roads that could be used for touring. R. H. Johnston, now New York representative of the company, was one of the earliest and most successful pathfinders.

In the subsequent chapter dealing with the history of good roads, some of his experiences have been used to illustrate the conditions of those days. The company took the attitude that no matter how good a machine an automobile might be, unless there was some place to run it, nobody would buy. Therefore, it did what it could to find places where cars could be run, and, not finding many such, advocated good roads with a persistence and energy that proved quite effective. Likewise, it was very intelligent publicity work that the company did through Johnston.

Up to the time it was abandoned by the company the steam car idea had been developed to its natural limit by the White company. The steam car was the first of all the automobiles; it was the father of the railway locomotive and it took 150 years to exhaust its possibilities. Eventually the end came and the steamer, with all its comfort and satisfaction in service, with its speed and hill climbing ability, had to make way for its livelier step-brother, the gasoline car. The beginning of the end of the steam car was in 1905, although there were no indications of it in that year. But looking back one can see that the strides being made by Pierce-Arrow, Peerless, Packard, Locomobile, Winton, Olds and a dozen other companies at that time, made it certain that the day of the steamer was almost done—and so it proved.

The excellent reputation made by the steamers continues to the present. Stanley is profiting by it to-day. There are still enough of the public who want steam cars to keep that veteran company busy, and, judging from current indications and the 1916 schedule, it will

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PIERCE-ARROW OF 1901

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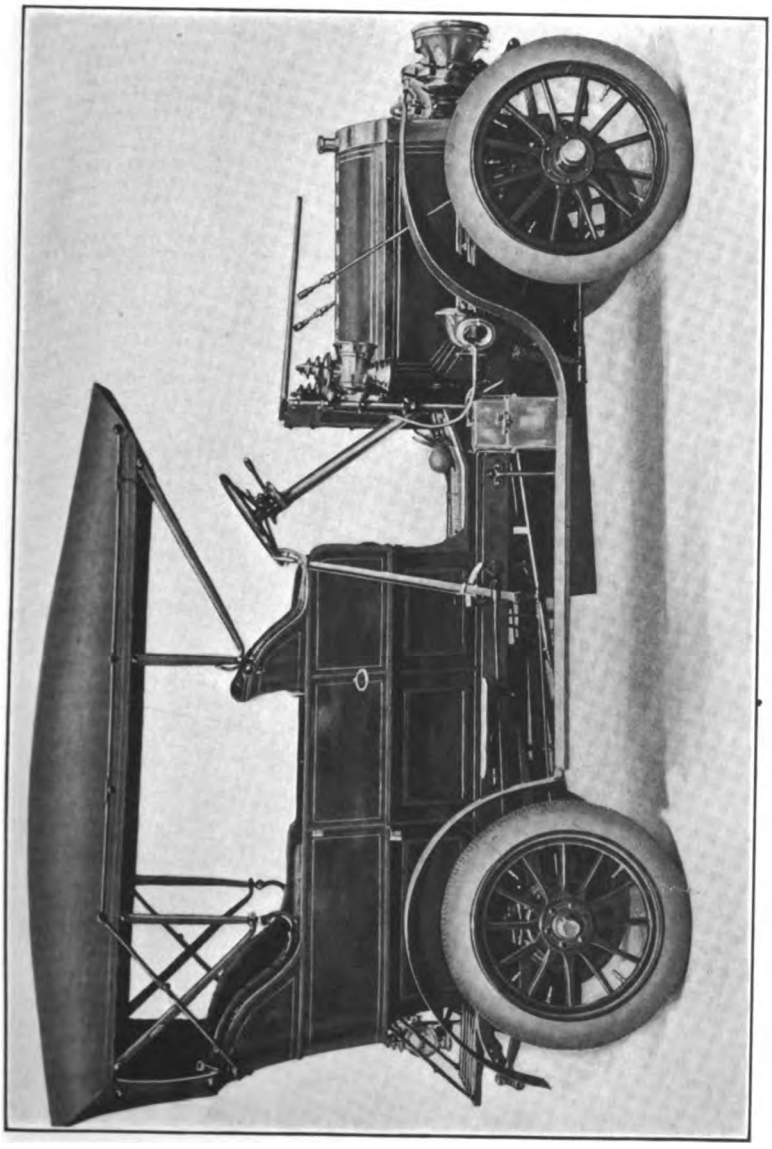

PIERCE-ARROW OF 1906

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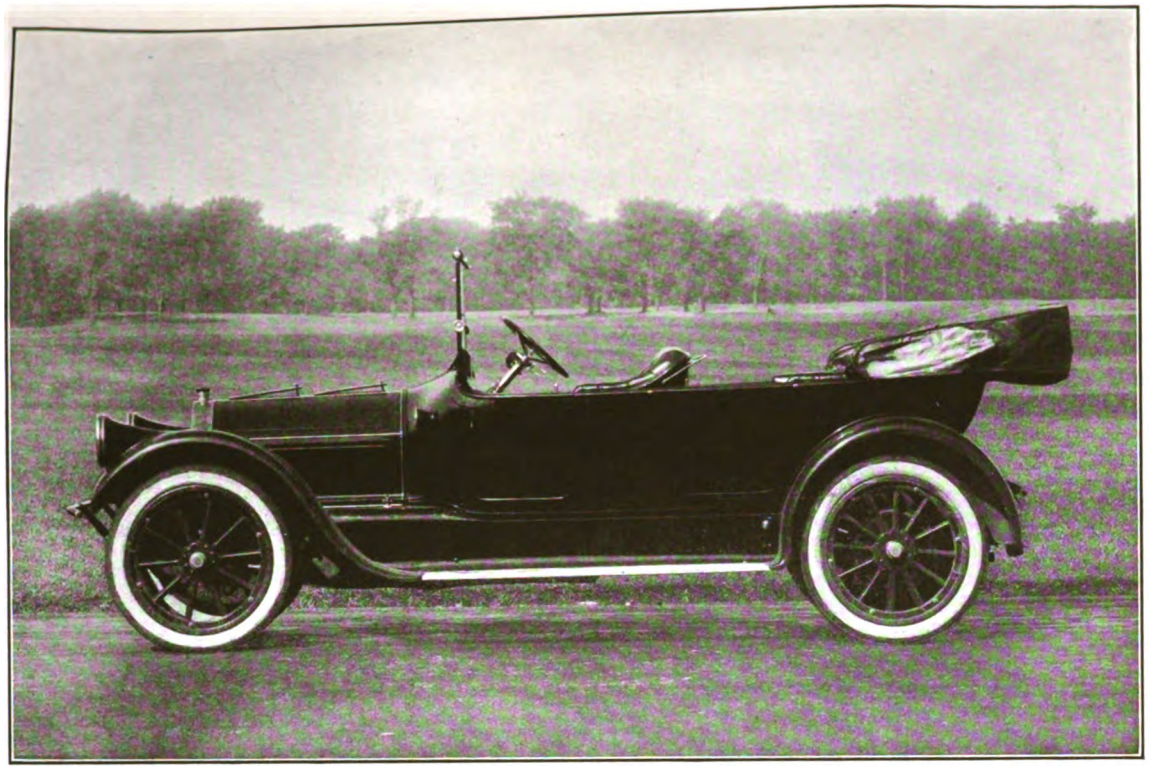

PIERCE-ARROW OF 1916

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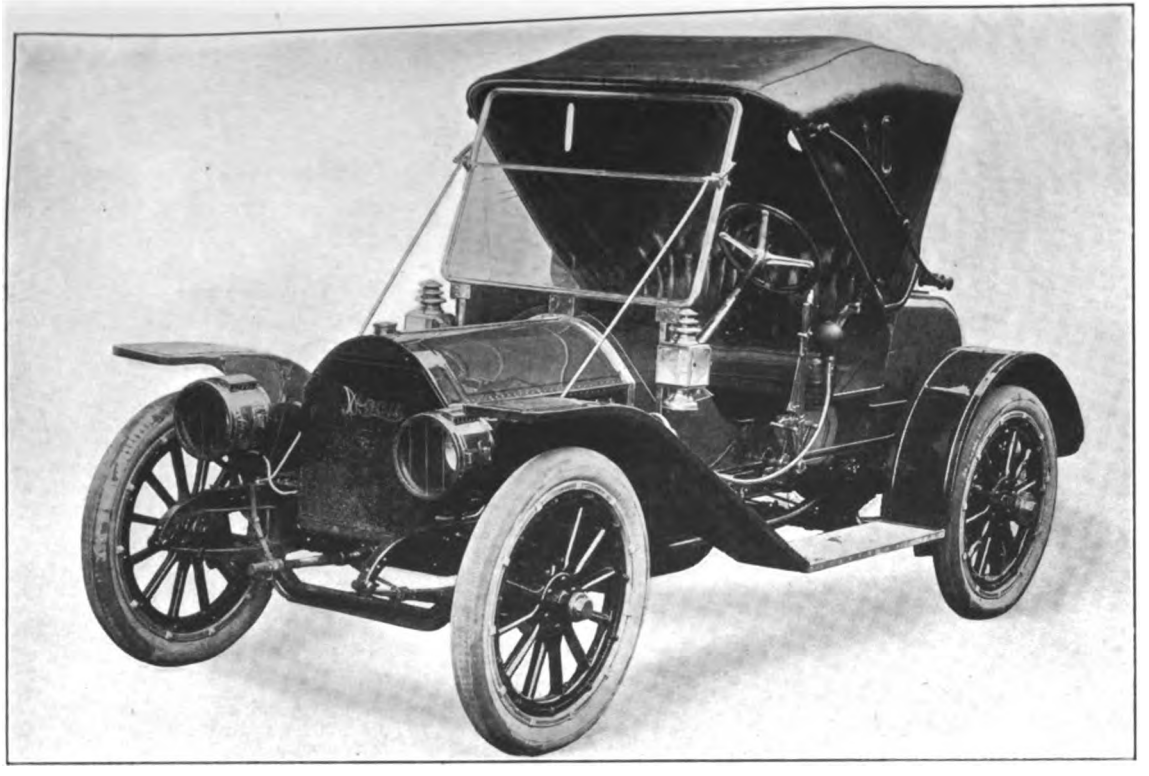

MOON OF 1906, SHOWING LEFT DRIVE

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be some time indefinitely in the future before it can be written that steam's service on the road has been definitely and finally finished.

CHRONOLOGY OF THE INDUSTRY

The period from 1890 to 1900 saw the birth of scores of gasoline cars and the labor and success of Elwood Haynes stands out prominently among the pioneers. Haynes is a scientist, famed as highly in the world of metallurgy as in the field of automobile making. He was one of the first engineers to discover that the steel in the Mercedes axle of a certain period was different from that used in the construction of the American cars of the same period. It is due Elwood Haynes that some of the credit for introducing alloy and heat-treated special steels into the American automobile should be given him.

Haynes' first automobile was a one-horsepower car driven by a marine motor, since abandoned in automobile practice. It was quite efficient in its day. Compared with the first car of Duryea, which was a frank adaptation of the ordinary form of horse-drawn buggy, in which the motive power was a gasoline engine in place of a horse, and Henry Ford's fast but crude-looking little car of 1893, the Haynes car was a symmetrical beauty.

Haynes experienced great difficulties in manufacturing his car after it was perfected and still more in getting it to market, but his skill and perseverance overcame the troubles and the company over which he presides is rated among the real factors in the industry to-day.

Ransom E. Olds of Lansing, Michigan, built a three-wheeled steam car in 1887, which was the forerunner of his activity in the automobile field. Olds gravitated from steam to gasoline and scored quite as great a triumph with the low-priced Oldsmobile as Winton did in the higher priced field before 1900. Olds brought out the Reo at a later period that is considered a leader in its class to-day. The curved-dash Oldsmobile, the best car of its price class in its day, did a real service in bringing the car to the favorable notice of the public. Olds did a big thing by proving the falsity of the arbitrary notion that the public would not buy road vehicles listing at more than $500, and he taught quite as important a lesson as Winton and Haynes in the

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field for larger and showier vehicles and the foreign makers of cars listing up in the thousands.

There were a dozen or more pioneer manufacturers engaged in building automobiles before 1897, the accomplishments of whom are mentioned in this section or in other parts of the work. A few had companies, but in considerable part they carried on their work as individuals.

In 1897 the Autocar Company commenced business. John S. Clarke saw Duryea driving one of his cars as an attraction of Barnum & Bailey's circus in 1896 and became thoroughly impressed with the utility of the "horseless carriage." It was only a short time before the Autocar Company came into existence and began manufacture.

In 1898 the Adams-Farwell Company was formed and began to manufacture special cars. This company bore a small part in the development of the industry, but on account of its territorial location it never assumed major proportions. Stanley Brothers entered the commercial manufacturing field in that year, as did Stearns, Matheson, Thomas and Winton. Winton, of course, had done much work prior to 1898 and had manufactured cars that would run, at least two years before. Stearns made a car in 1896 and worked on several others prior to his commercial entry into manufacturing. Thomas simply evolved from the motorcycle to the car. The Waverley Company started.

In 1899 the Locomobile Company of America started manufacturing for the market, as did R. E. Olds, Baker Electric and the Pierce-Racine company. The latter finally was absorbed by the J. I. Case Threshing Machine Company and still lives in the modern Case car.

In 1900 Austin, Glide, Lambert, Elmore, Jackson, Knox, Lane, the National Electric, Babcock, Packard and Peerless became elements of the manufacturing industry. It should be understood that all these companies had actually turned out cars previously.

In 1901 Acme (later the S. G. V.), Gaeth, Pierce-Arrow, White, Royal Tourist, Stevens-Duryea, Waltham-Orient, Pope-Toledo, Welch, Pullman and Rambler (now Jeffery) entered the field, all having done experimental work and turned out cars prior to the year mentioned. Pierce-Arrow particularly had been experimenting and developing since 1898, making a careful examination of the European art and perfecting plans and designs.

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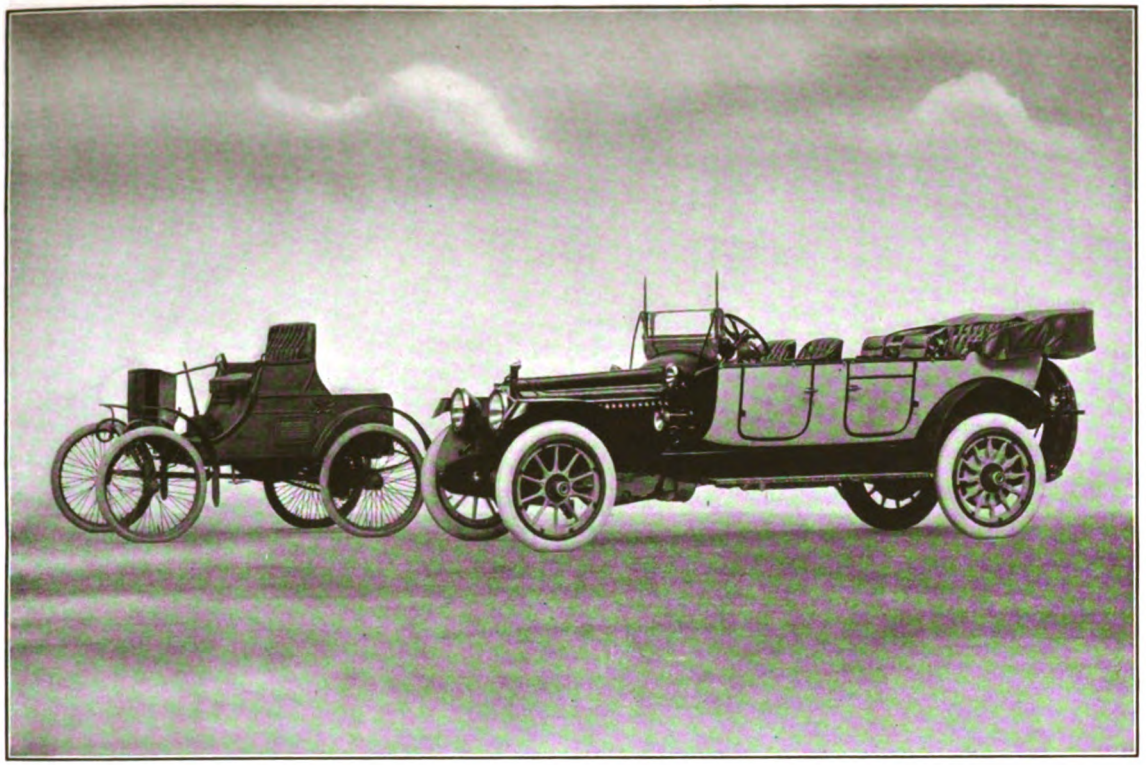

SHOWING FIFTEEN YEARS OF PACKARD PROGRESS

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ALDEN L. McMURTRY, M. E.
At wheel of largest single cylinder Packard built

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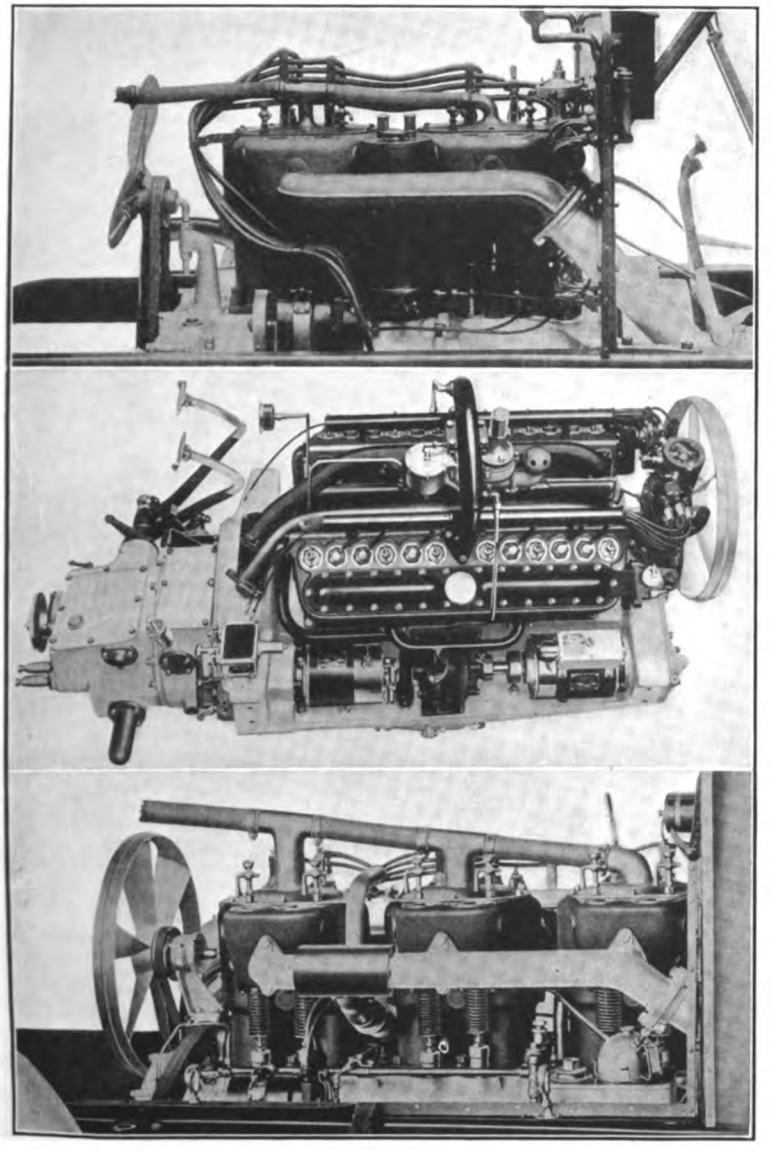

STANDARD AUTOMOBILE MOTORS OF THREE PERIODS
Above, four-cylinder; below, six-cylinder; middle, twelve (Packard).

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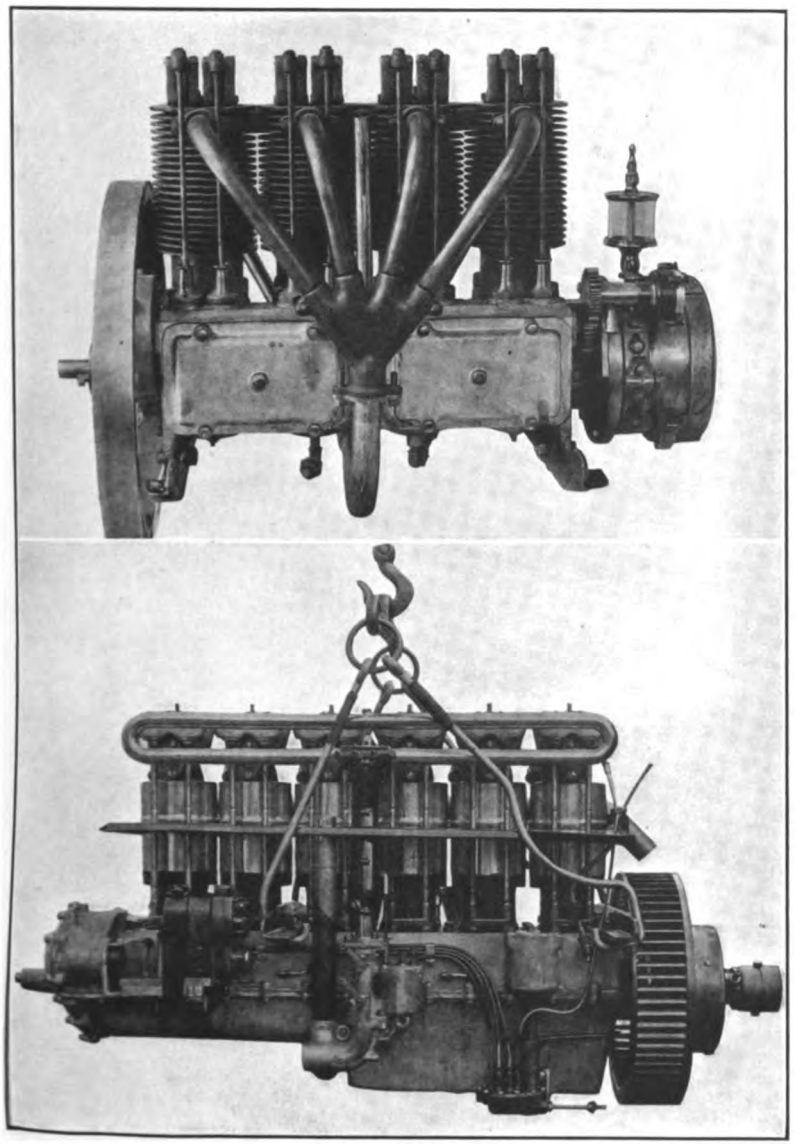

FRANKLIN MOTORS OF 1903 AND 1916

The only really successful air-cooled automobile engine of the industry

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In 1902 Cadillac, Franklin, Pope and Studebaker came along. Pope actually dates back to 1895, Franklin to 1898 and Studebaker in the vehicle field is the oldest of the lot, having occupied the leading place in the road transportation of the world for half a century before. Our grandfathers used to sing:

"We'll wait for the wagon—the Studebaker Wagon—
We'll wait for the wagon and we'll all take a ride."

long before the automobile was conceived.

Sultan, Okey, Walter and Schacht were introduced in 1902.

1903 saw the real beginning of the automobile industry. All the companies mentioned heretofore and scores of others that have passed away were working feverishly to supply the demand for better transportation. Ford started commercial manufacture, although his actual participation in the industry dates back ten years. Auburn, Bergdall, Holsman, Columbus, Chadwick, Moline, Overland, Corbin and Premier were the notable additions to the industrial army in 1903.

The following year the more prominent recruits were Buick, Cleveland, American Napier, Stoddard-Dayton, Mitchell, Jewel, McIntyre, Marmon, Pittsburg Electric, Rauch & Lang and Simplex. It should be noted that Mitchell really goes back to 1903 and that Simplex dates from the early art of Europe, as it was an evolution of European ideas adapted to American conditions. Marmon started building in 1902.

In 1905 the Alco, American, Dorris, Johnson, Jonz, Kisselkar, Maxwell, Monarch, Reo, Studebaker-Garford and American Mors entered the lists.

In 1906 the Anderson Electric, later to become leader in its field; A. B. C., Cartercar, Brunn, Thomas-Detroit, Kearns, Sterling, Mora, Moon, Pennsylvania, Palmer & Singer, and Staver began commercial business.

In 1907 Albany, Atlas, Brush, Bertolet, Byrider, Carter, Chalmers, Coppock, De Luxe, Oakland, Regal, Selden and Speedwell started in earnest. Interstate, Great Western and Lozier put out cars.

The 1908 companies include, among others: Sharp-Arrow, Pittsburgh 6, Crown, Midland, Rider-Lewis, Paige-Detroit, Velie, Cole, E-M-F and Hupmobile.

In 1909 Hudson, Advance, Cunningham, Coates-Goshen, Ohio, Abbott and a few others entered commercial manufacture.

Since 1909 the additions have been surprisingly few. When one

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has mentioned Scripps-Booth (1913), Dodge (1914), and Saxon (1913) in the Detroit field; Dort (1914), Chandler at Cleveland (1913), Grant (1913), Chevrolet (1912), Owen-Magnetic (1915), the chief important factors have been included except Stutz (1911).

The above mentioned companies by no means embrace the whole automobile industry. Some of them have passed away via the combination or bankruptcy routes, but in the list will be found all the more important factors in the autombile industry as it is and was.

Some idea of the mortality of automobile companies may be gained from a close examination of the list. The panic of 1907 swept away dozens; in 1910 there were 52 failures. The old-timers in the automobile industry have almost forgotten the names of Northern, Searchmont, Long Distance, Frontenac, Black, Cameron, Ranier, Allen-Kingston, Warren, Lion, Herreshoff, Courier and numerous others, and yet some of them left the active industry only a comparatively short time ago.

The gasoline passenger car industry of 1916 includes 276 companies, the output of which amounts to considerably over one billion dollars. Owing to the terrific demand for cars, the company mortality recently has been reduced to the vanishing point throughout the industry.

All told, the commercial history of the automobile is unique in its brevity, its success, its unprecedented size and in its effect upon civilization.

THE DEVELOPMENT OF THE MOTOR

The idea of using several cylinders in the automobile engine had been developed very early in automobile history. Selden contemplated the use of three cylinders and a three-throw crankshaft, but the earliest efforts of the builders of cars were directed toward the single-cylinder engine. When the first two-cylinder motors were brought out, there was a warm argument between their advocates and those who clung to the single-cylinder type.

The inefficiency of the single-cylinder motor as compared with the engine of two cylinders was recognized almost universally as soon as the double-cylinder motors were fairly before the public, because it is quite obvious that a power-stroke once in two revolutions leaves too

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much of the engine's operation to the weight of the fly-wheel and the momentum of the mechanism.

About a dozen engineers and at least four manufacturers were working with the four-cylinder, four-cycle type of automobile motor in 1902.

The four-cylinder advocates, immediately came into contact with those who believed in two cylinders and a campaign of advertising that was almost bitter was carried on for several years after 1902. The two-cylinder advocates had to yield in the end and the four-cylinder car became the standard of the world.

The engineers who favored the four-cylinder motor used exactly the same argument against the two-cylinder type as the latter had used in decrying the single-cylinder and as it was unanswerable in truth, the two-cylinder makers either took up the new idea or dropped out of the industry.

But other kinds of engines were also used, Duryea adopting a three-cylinder motor a little later. Alexander Winton raced an eight-cylinder car, one of his series of historic Bullets, but the real progress of the period was in the direction of the standard four-cylinder engine.

Winton, undoubtedly, was the first manufacturer to attempt the use of an eight-cylinder engine, but it should be remembered that John D. Maxwell made and ran an experimental car with sixteen cylinders and managed to make at least one very fast mile. This was in 1906. The car was not a success, owing to the extreme difficulties of timing the motor and securing a steady, equal flow of fuel to all the cylinders.

De Dion-Bouton really should be credited with developing the eight-cylinder motor. This great French company used a perfected type of V-shaped eight for several years before the American engineers and manufacturers illustrated the feasibility of that type in quantity production. Cadillac was the pioneer in 1914 and was followed by a host. In 1915 Packard stepped out into pioneer ground with a twin-six or twelve-cylinder motor. Since then nearly a score of companies here and elsewhere have announced "twelves."

The argument in favor of the eight against the six was similar to the one made in favor of the two against the one and the four against the two. In fact, that of the advocates of the twelve is the same as the others referred to, but lacking the bitterness of the earlier period. It is simply this: In a four-cycle motor there is one power stroke for each cylinder in two revolutions of the crankshaft, or one power stroke

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for each 720 degrees. In a two-cylinder motor there is a power stroke once in 360 degrees; in a four-cylinder motor, a power stroke in each 180 degrees; in a six, one stroke in 120 degrees; in an eight, one stroke in 90 degrees, and in a twelve, one power stroke in 60 degrees.

Nevertheless, the current schedules consist of a majority of standard four-cylinder motors, due of course to the huge outputs of Ford, Maxwell, Dodge and a few others. The tendency, however, indicates that in a few seasons the average car will have more than four cylinders, which does not mean that the four-cylinder type will pass away—simply that there will be larger outputs of the small multi-cylinder types.

THE MANUFACTURING GROUPS

The pioneer makers, Duryea, Haynes and Ford, were all mechanical geniuses, and worked almost alone, as might be said of every one of the men who produced automobiles prior to 1898. The first manufacturers for the commercial field were evolved from the bicycle industry. Winton and Thomas are excellent examples, and so are Pope, Pierce, Jeffery and Columbia. The next factor to enter the industry was the one that might naturally have been selected as the most likely element to have assumed leadership in the manufacturing field at the very outset—the vehicle makers.

But the vehicle makers held off until they were practically forced to give the new art their attention. Studebaker was the first great wagon manufacturer to enter the automobile industry, in 1902, and was followed by Moline, Mitchell, Moon, Staver and Cunningham. At first the idea seemed to be to produce cars that were different from the average automobiles of the various periods, but later the carriage men adopted conventional lines. The first Studebakers were very fine electrics, passenger and commercial. The Moline cars always have been different from the average, first in the long stroke motors used and in modern practice the perfection of the Knight engine. Mitchell started to build automobiles that would displace the driving horse and gradually developed into one of the most striking of the companies turning out standardized cars in quantities. Moon strove for quality at moderate price and made a distinct impression. Staver sought to earn patronage through the production of a car having power in

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JOHN NORTH WILLYS
President Willys-Overland Company

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GEORGE W. BENNETT
Late associate of John North Willys.
A Dynamic Driver of Men.

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SIDNEY D. WALDON

Vice-President Cadillac Motor Car Company. Late Vice-President Packard Motor Car Company.

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WILLIAM MITCHELL LEWIS
Lewis Motor Company. Founder Mitchell-Lewis Motor Company, etc.

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excess at a low price and Cunningham always has emphasized quality and custom work.

At the beginning of 1916 there is scarcely a wagon maker doing business in the whole country that is not engaged in making automobiles.

Among the more recent entries of vehicle or farm machinery men into the automobile industry should be mentioned the late D. M. Parry. The product of that company did not continue long under Parry's name, but the activity of the company was carried along after his death by W. C. Teasdale, Jr., in the name of the Pathfinder, a twelve-cylinder car of stately appearance.

All told the carriage men have done well in the new industry, being represented in every class of car turned out in the current schedule.

The machinery industry also played a very important part in making automobiles.

Cadillac, Marmon, Alco and Brush are fine examples.

But in the main the companies that engaged in motor car manufacture were born for the occasion, or else received such an infusion of new blood at or after the beginning of automobile-making that they might as well have been new concerns. Pierce-Arrow and Packard, Franklin and Reo illustrate this idea in clear style. Pierce-Arrow bears little resemblance to the old bicycle organization, either in methods, men or scope; Packard was metamorphosed from a factory and organization making lighting fixtures to its present shape; Franklin was changed from a comparatively small factory to a giant automobile organization and Reo was called into existence for the single purpose of making motor cars. In each case it was the genius of one man, his power and insistence that brought the results.

Among the latest recruits to the automobile line-up are numerous companies that may be considered as second-generation concerns. Such for instance as Saxon, Chandler and Dodge. Each of these companies is headed by men who were actively engaged in somewhat different stations in other and older companies. H. W. Ford was publicity man for Chalmers before he formed the Saxon company, producer of the sensationally successful line of motor cars bearing that name.

The Chandler company of Cleveland is probably the most brilliant financial success of the automobile industry, reckoning time as the prime measure of its accomplishment. F. C. Chandler while connected

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with the old Lozier company was never rated as a manufacturing genius. He was an executive of high qualities but not specially noted as a manufacturer. Charles A. Emise and W. S. M. Mead were salesmen and J. G. Perrine was an engineer, all old Lozier officials. And yet Chandler was a manufacturing genius, as the success of the enterprise has proved. It may be noted that the original investment returned something like 35 for 1 in a period of less than three years.

Dodge Brothers—Horace E. and John F. Dodge—made essential parts of the Ford car for many years, and when they decided to manufacture their own automobile it was almost a sure thing that the product would prove a success. In about two years the Dodge car has assumed a commanding position in the field, due chiefly to the manufacturing processes developed by the Dodge brothers.

The spectacle presented by the forge room of the Dodge plant in full operation is an inspiration and might well be the subject of an artist's dream of the "Apotheosis of Industry." There is a minimum of lost motion and a maximum of efficiency apparent even to the casual observer.

But the great majority of companies building automobiles were not developed from anything else. They started generally with a set of blue prints and a lot of enthusiasm and a flattering percentage of them developed into manufacturing companies. The reefs and shoals of industrial life are dotted with the wrecks of many, but on the broad average, considering the newness of the industry and the radical developments that have been made in the car itself, the percentage is not markedly high.

Some of the concerns that started off with considerable noise failed to fulfill promises and some lacked capital to develop good ideas and practices. The original Paige company, incorporated in Michigan in 1908, did not make the impression that its friends and projectors expected that it would. It is immaterial now just what the trouble might have been, but at any rate in 1911 it was reorganized by a group of Detroit business men under the corporate style of the Paige-Detroit Motor Car Company. Harry M. Jewett, college athlete and well advanced in the way of becoming a coal magnate, became president and his associates except those in the engineering and production departments were unknown in the industry. The history of Paige-Detroit since then reads like a romance. The first attempt to manufacture was, frankly, a failure. The second season the company put

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out 800 cars; in 1914, 5,000 cars; in 1915, more than double, and the 1916 schedule has a "quantity production" appearance.

President Jewett simply applied the wisdom and experience of other lines of industry to the manufacture of motor cars, much the same as Hugh Chalmers did in 1907. Indeed, he took over one of the Chalmers superintendents, James F. Bourquin, and made him general manager.

There was absolutely nothing unique about Jewett's plan. He introduced scientific business methods into motor car building in a concern where such methods were needed. Co-operation, which might also be termed co-ordination, was the keystone of the business structure that Jewett built. Paige-Detroit is rated as one of the sensational successes in recent years of the industry, as may be gleaned from the fact that in 1915 it paid dividends in cash amounting to 68 per cent.

The rehabilitation of Maxwell is the only story of its kind in the whole field that compares with that of Paige, and there are only a few points of similarity in both.

Jewett and his associates—Edward H. Jewett, a coal man; Gilbert W. Lee, grocer and banker; James F. Bourquin, of the Chalmers company; William B. Cady, paper manufacturer; Charles B. Warren, counsel; Charles F. Hodges, manufacturer and banker; Edward D. Starr, publisher; Willis E. Buhl, foundryman, and Sherman L. Depew, shoe manufacturer, took hold of the company with the idea of designing, building and marketing an automobile according to scientific engineering, manufacturing and business methods. That was all.

There are numerous other companies in the present field that have salvaged older concerns—in fact, the record is full of them—but the experience of Paige-Detroit is probably the most striking example in the history of the industry.

THE MEN WHO MADE THE AUTOMOBILE

With but few exceptions, all the men who were prominent in the pioneering days are still actively identified with automobile manufacturing. Haynes, Olds, Winton, the Apperson brothers, Selden, Riker, Ford, Wilkinson, Joy, Clifton, Stearns and Clarke are at the helms of their respective companies, despite the fact that they were

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the pioneers of the American industry and date back to the last decade of the past century for the beginnings of their activities in automobile manufacture.

E. R. Thomas and Duryea no longer head companies and S. T. Davis, Jr., is dead. The Pierce-Racine has gone the way of consolidation and Stanley sticks to steam.

Thus of the seventeen pioneers, whose influence to-day is real and potent, twelve are at headquarters; one has lost his identity by merger; two have dropped out; one is dead, and the last clings to steam.

R. E. Olds, known throughout the industry as the Schoolmaster of Motordom, probably trained more men of prime importance to the industry to-day than any other pioneer. Olds founded the Olds Motor Works at Lansing, Mich., in 1896. While he did not enter the manufacturing field on a commercial scale until 1900, his factory at Lansing turned out experimental cars that date back to Winton's starting period. At various times in the early days of the industry Olds employed dozens of brilliant young men who branched out for themselves at later dates. Among these are numbered:

J. D. Maxwell, designer of the Northern and later the Maxwell cars manufactured by the Maxwell-Briscoe Company, and one of the real potent influences of the business. Maxwell, however, was originally employed by Elwood Haynes in his very early pioneer work.

Howard E. Coffin, "Father of Standardization," past president of the Society of Automobile Engineers and vice-president of the Hudson Motor Car Company; the engineer who designed the Chalmers and Hudson cars, was also a graduate.

Roy D. Chapin, president of the Hudson Motor Car Company, almost the senior ranking president of the Detroit automobile field, despite the fact that he is probably the youngest chief executive officer in that field, likewise received his early training in the Olds establishment.

The list of Olds graduates might be extended considerably without exhausting its possibilities, but the three men named are sufficient to convey the idea of its importance to the automobile.

Maxwell's service may be regarded as epochal in the improved type of car he gave the world; Coffin, successful in engineering, loaded with the exacting honors of the chairmanship of the Naval Advisory Board, is ranked by many with the first automobile engineers of the world, and Chapin, the leading figure in the intelligent movement to

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H. M. JEWETT

President Paige-Detroit Motor Car Company. "An Apostle of Co-Operation and Co-Ordination."

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W. H. VANDERVOORT

President Moline Automobile Company.
Past President (1915) Society of Automobile Engineers.

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HOWARD C. MARMON

Nordyke & Marmon Company. Inventor of side doors in American practice (1902), first user of pressed steel frames and numerous other details. Past President Society of Automobile Engineers.

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LEWIS HARRIS KITTREDGE

President of the Peerless Motor Car Company, and veteran member of National Manufacturing Organizations.

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secure good roads, are enough to demonstrate that the Olds establishment must have been a place teeming with ideas.

The Apperson Brothers, who supplied the factory facilities for the building of Haynes's early cars, and who were associated with that eminent scientist in commercial production for many years, have received rather less credit for their services than is properly due. Elmer Apperson and his brother invested money, time and reputation in the development of Haynes's ideas at a period when such investments were generally held to be legitimate reasons for cancelling bank credit. If differences arose between the partners at a subsequent time, leading to a split-up, it should not becloud the fact that the Appersons had a very definite hand in developing the first real automobile. It should be duly noted that the first Haynes car was awarded a medal for automobile design, because it departed from the horseless-carriage idea.

Likewise it should be chronicled that the product of the Apperson Brothers Automobile Company has played an interesting and important part in popularizing the automobile from pioneer days to the present.

Henry B. Joy, president of the Packard Motor Car Company, was one of the very few men who entered the automobile industry equipped with wealth. Joy, a member of one of the most aristocratic Michigan families, became interested in motor cars a short time after they began to run. He became acquainted with Henry Ford and did his best to buy one of the first experimental cars turned out by Ford at a time when such a sale would have displaced Winton from his position as the seller of the first car. Ford was not satisfied with the car and cautioned Joy not to buy it, promising him that the next one completed should belong to the present head of the Packard company. Ford did not enter the commercial field for several years after their conversation, and when he had a "next car" to deliver Joy was out of the market.

But in the interim, Joy had become acquainted with Col. J. W. Packard, of Warren, Ohio. Packard was head of a concern engaged in making lighting fixtures, and was one of the early purchasers of a Winton car. Joy purchased one of the first cars made by Packard's concern and immediately became so much interested that he secured a large share of the Packard company's stock. The plant was removed to Detroit, where the present gigantic establishment is located.

Joy has ever been a potent force in the automobile industry. A

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fighter of power and discretion, he has battled to tear down some of the practices that appeared to be wrong to him; such, for example, as the continuance of the high rate of royalty demanded under the original agreement of the Selden licensees and the Electric Vehicle Company, and he has battled to build up structures that seemed to be good and constructive to him, such as the product of his company and the basic idea of good roads.

Working along different lines but in complete harmony with R. D. Chapin, Windsor T. White and Amos G. Batchelder, Joy is deservedly one of the greatest exponents of better roads. His interest in the Lincoln Highway is only one of numerous expressions of his efforts to secure the extension of highways.

Frank B. Stearns, son of a Cleveland millionaire, commenced building automobiles when little more than a boy. When he started in 1896 he used the family barn for a workshop and financed his plans out of his pocket-money, plus what he could persuade his family to give him. At first, the older members of the Stearns family were distinctly doubtful and pessimistic about the whole idea, but after a few years they became much interested in the experimental work and gave encouragement to the youthful inventor.

The Stearns company never was a large concern, but it always has been prominent for its progressive ideas. For instance, its adoption of the Knight motor, first in four-cylinder cars, then in sixes and currently in the eight types, was a series of daring steps.

John S. Clarke and Louis S. Clarke were among the first to market an American built gasoline automobile, the first Autocar. They turned out a few cars in 1897 and sold several in 1898. The Clarke Brothers and their associates have borne a continuous part in the growth and development of the industry and always have been an important factor in it. Save for refinement of details in their product, they clung to the two-cylinder type of engine without material change and found a steady market for their output. At the beginning of 1916 they had a practical monopoly in their special line.

The service of David S. Ludlum, president of the Autocar Company for many years, does not date back quite so far as that of the Clarkes, but has proved to be an important element in the success of the company.

E. R. Thomas, head of the companies that made the Thomas-Detroit and Thomas Flyer, and whose product ranked among the

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leaders for several years, is out of the active manufacturing industry. The fame of Thomas reached its climax in 1908 when one of his cars raced around the world from New York to Paris in competition with some of the best European cars of that period. Thomas was a railroad man and his entry into the automobile business was via the bicycle and motorcycle route in 1898. His company turned out cars ranging all the way from single-cylinder Black Cats as they were called up in Northern New York to the stately Thomas Flyer, some of which are still in service.

The greatest commercial success of Thomas began in the year 1906, when Roy D. Chapin pursued him from Detroit to California in order to present to him a proposition, the acceptance of which by the Buffalo millionaire proved to be one of the significant turning points in the industry. Chapin, hardly more than a boy in years, handled the negotiations with skill and completely won the confidence of Thomas, who, by the way, was about as difficult a man to approach as any the automobile industry has produced.

His plan was this: He knew Howard E. Coffin, who was even then rated as a first-class engineer, and both of them had worked for Olds. Coffin had designed a car that could be sold profitably at less than $3,000 and Chapin sought the aid of Thomas to build the car, and after it was built he wanted it sold through the Thomas sales organization, noted at that period as among the most successful in the industry.

Chapin's earnestness; his belief in himself and Coffin and the feasibleness of the scheme carried the day with the austere Thomas. He got the money; Coffin built the car and the Thomas organization sold nearly 500 of them in one year. It may be noted that among the star salesmen of Thomas was Harry S. Houpt, now head of the New York agency for the Hudson car. Houpt has documentary proof that he, single-handed sold 300 Thomas Flyers during his connection with the Buffalo concern. As the Thomas organization had other good men besides Houpt, the motive behind the action of Chapin in seeking to tie up with Thomas can be readily seen.

The success of the Thomas-Detroit was unusually complete for a brand new car, but Chapin's ideas had developed broadly and he had a very practical vision of vastly increasing the business. Coffin had refined his design so that the next model would be even better

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than the first and the selling price could be scaled down somewhat. The limits had been reached for the older model.

What they needed was preparation for expansion of sales and the introduction of a scientific business giant to execute it. They picked out the most prominent salesman in the world, one Hugh Chalmers, head of the distributing forces of the National Cash Register Company. Chalmers was making a trifle over $70,000 a year on his job and figured that he was underpaid. But he declined their initial offer of more money, because he thought he could do better in business for himself.

Rather than disappoint him and, incidentally, lose his services, Thomas and Chapin, with Coffin's full knowledge, decided to get Chalmers at any possible price. His terms were stiff, but the result after a short time was change of name from Thomas-Detroit to Chalmers-Detroit and the production in 1908 of the first Chalmers car.

From that moment until November 17, 1915, when Chalmers sold his entire manufacturing product of the 1916 schedule for $22,000,000 in the space of forty minutes, the force and power of Hugh Chalmers' personality has been a feature of the automobile industry.

Chapin and Coffin, however, only stayed long enough with the organization to see it well started on its romantic career. Then they formed the Hudson Motor Car Company in 1909, to-day one of the great successful concerns of the industry.

If "short sales" in a speculative sense had been legally barred from business transactions in the automobile field, we probably would have missed John North Willys. Willys backed into the automobile industry, and the cold records contain no more remarkable story than his. He was a kind of head salesman for a sporting goods house in Elmira, N. Y., before he became much interested in the automobile. As it developed, he recognized the fact that in its early forms and stages it was a real element in outdoor sport.

It was not long after he made this discovery before he started to take part in what was frankly a game. In 1907, already having secured the selling rights for the old Overland, he marketed 500 cars for future delivery and accepted deposits from the purchasers.

Down in Wall Street there is an old saying that runs something like this:

"He who sells what isn't his'n
Must buy again or go to pris'n."

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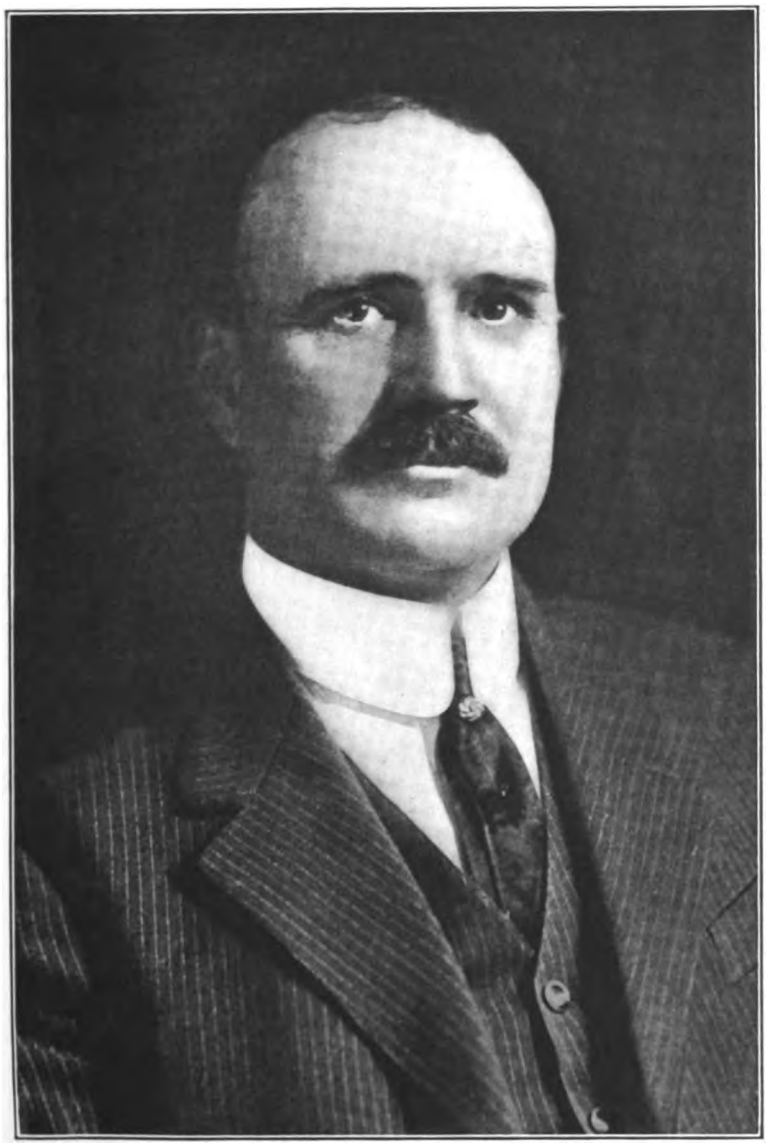

CHARLES W. NASH

Late President General Motors Company. A manufacturer of extraordinary ability, who shouldered immense responsibilities and performed a constructive service.

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GEORGE E. DANIELS

Head of the Oakland organization during its period of growth, now manufacturing car of his own design.

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ALVAN MACAULEY

Efficiency expert recently chosen head of Packard Motor Car Company.

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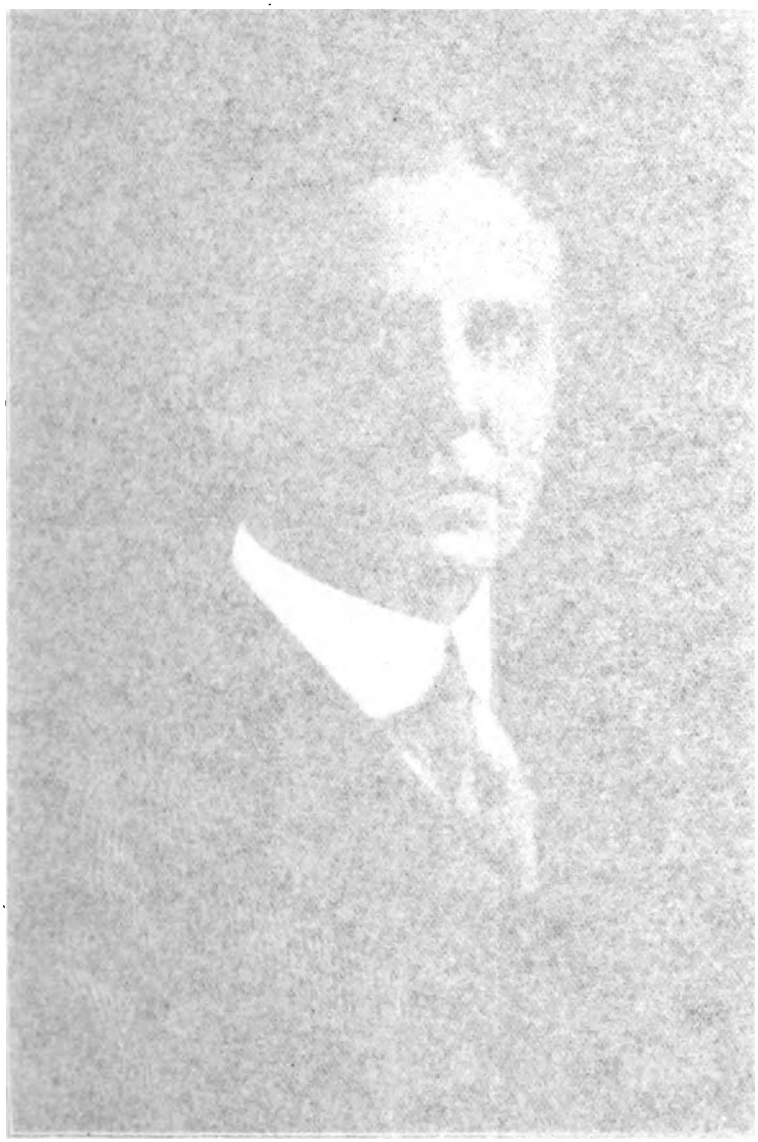

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J. WALTER DRAKE
President Hupp Motor Car Corporation.
Pioneer, Manufacturer and Financier.

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In other words, it was distinctly "up" to John Willys to see that those Overlands really emerged from the blue-print stage and became automobiles, although he had acted within the ordinary commercial practice and was in no possible danger of legal difficulties. However, the future of Willys really required the manufacture and delivery of those cars.

He was not a manufacturer in the technical meaning of the term and never intended to be. But one day before the cars had progressed to a tangible, deliverable stage, the factory found itself so short of funds that it could not meet its weekly payroll.

That was where Willys became a manufacturer, because he was able to borrow enough to pay the hands, and from that moment almost he took place as one of the most important figures in the field.

There are a number of interesting stories told as to how Willys took his first step toward leadership in automobile making. One is that Thomas Forbes, who was then associated with him, pawned his tie-pin at Willys' suggestion to fill the pay envelopes on that fated Saturday. Others are to the effect that Willys made a round of his friends and instituted a series of "quick touches." Maybe both stories have some elements of truth in them. The amount involved was $450, according to several good authorities.

It was "touch" and go for the immediate future, but Willys, through his personality, enthusiasm and faith in the industry, the Overland and John Willys, managed to pull through the critical period. Willys pooled his personality, ability and $11,000 in money against the properties of the Overland; capitalized the combination so that it was able to secure the defunct Pope-Toledo; absorbed the Morrow and Kinsey companies, manufacturers of certain vital parts of the cars; added this, that and the other concern to the aggregation, and finally sought and obtained the underwriting, capitalization and flotation of the whole vast project in Wall Street by William Solomon & Co.

At a late stage, Willys adopted the Knight sliding-sleeve motor for one line of his output, and, following his own efficient methods of selling, has done much to popularize that kind of an automobile motor.

The late George W. Bennett exerted a powerful influence on the career of Willys. Bennett for several years was close to his chief, and it was within his province to construe and administer his ideas and policies. Bennett was a driver like none produced so far in the indus-

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try. He had many of the qualities that are found in great military commanders, and yet he ruled the Willys plants, enterprises and sales in such a way that he inspired the kind of loyalty that reckons blood-letting a privilege. When Bennett died Willys lost a friend and associate who had been instrumental in shaping many of his big policies, and that event probably had a deeper significance on the transition of the Overland properties from a one-man concern to a vast national corporation, than many close observers have given it credit.

Leland & Faulconer, machine builders of Detroit, did a lot of experimenting with automobiles about the time R. E. Olds was engaged in developing his first single-cylinder car. Henry Ford had a machine shop near the Leland & Faulconer plant and was busily engaged in turning out a few cars under the business designation of the Detroit Automobile Company.

In 1901 Alanson Partridge Brush, a boyish engineer employed by Leland & Faulconer, announced to the firm that he had completed the designs for an automobile. When Ford's enterprise did not materialize the machine company acquired his shop and Brush went to work to build the car. In 1902 he had a pretty serviceable automobile running around the test track and streets and in 1903 the Cadillac was born in a commercial sense.

Henry M. Leland, general manager of the company, insisted that the debut of the new car should be postponed until Brush could demonstrate that he really had a superior product. This Brush was able to do in 1903, and from that moment the place of Cadillac in the field of the automobile has been established. From the old single-cylinder model, through the period of the epoch-making "four" and down to the modern V-shaped eight, the relative place of the Cadillac has been taken for granted by motordom.

Brush started his own company after leaving Cadillac and put out the Brush runabout, an excellent automobile of its type that continued long after all the other single-cylinder cars had been abandoned. His company was taken over by the United States Motor Company and in 1911 the car passed out.

Cadillac continued as an independent concern until 1909, when it became a part of General Motors, the consideration being $4,500,000 in cash. Henry M. Leland and Wilfred C. Leland of the original machine company remained with the company as its active heads.

General Motors' career is really a series of financial operations, as

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the company was not engaged in manufacture as such. Its history is covered in another chapter devoted to finance, primarily.

But Cadillac was the backbone of General Motors before and during the dark days of 1910, and is so to-day.

Thomas B. Jeffery, bicycle maker, tire manufacturer and automobile pioneer, was a potent force from the time of his entry into manufacturing to the day of his death. The part he played as inventor of the clincher rim is told elsewhere. Jeffery grasped the significance of the automobile back in 1897 and after a protracted period of experimentation with the motorcycle and quadricycle, evolved the Rambler as a commercial element in 1901. He put Kenosha, Wis., on the industrial map, just as Pierce, William Mitchell Lewis and John W. Bate emphasized the importance of Racine, ten miles to the north.

Jeffery was head of the old firm of Gormully & Jeffery, makers of the Rambler bicycle. His name is associated not only with the great automobile company, but is imperishably identified with the G. & J. tire, although the concern that manufactured it has long since become merged with the United States Tire Company.

The H. H. Franklin Manufacturing Company, of Syracuse, N. Y., has occupied the premier place in the field of the air-cooled motor for fifteen years, and is practically the only prominent user of that type of motor to-day. The company succeeded where a whole battalion of inventors and engineers failed.

John Wilkinson, inventor and designer of the Franklin car, began experimenting sometime before 1898. He had his ideas pretty well perfected at the dawn of this century and in 1902 entered the commercial manufacturing field. Wilkinson turned out one of the first four-cylinder cars and the line of manufacture over which he still presides is by all odds the leader of its type and has been from the start.

It is puzzling to the layman to understand why Franklin and Wilkinson have been left alone to enjoy the exclusive field of the air-cooled motor, and there is no question about their enjoying it. Water-cooling systems mean more weight, and weight is something to be limited in automobile making. Heat is another form of power, and every thermal unit neutralized by water means that much lost power. There is something strange about the matter, but it certainly does not seem to have affected Franklin unpleasantly, to say the least.

At the end of 1915 nearly 37 years have elapsed since Selden

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drew a picture of the automobile in his patent application. It has been almost thirty-one years since Benz made and ran his tricycle. It has been about twenty-three years since Duryea scared the first horse and driver, mostly the latter, by driving his buggyaut on the highways, and almost eighteen years since Winton sold his first car. The world is a very different sort of a place in 1916 than it was in 1900. The vital statistics show that the average span of human life is longer now than then. Perhaps it is because life is better worth the living.

At any rate, the coming of the motor car has robbed isolation of its sting and burst the bonds of narrow localities, and if those things are advantages, should be crowned as the greatest benefaction of man's history.

Every element of the giant industry has done well and is deserving of thanks and appreciation—the pioneers, the manufacturers, the specialists who have introduced improvements that are embodied in the modern car—because they have brought into being a radical change in road transportation which is more important for good than the world war is for the opposite.

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CHAPTER II

THE ROMANCE OF THE INVENTORS

AS childbirth strains every resource of the human mother, so invention calls forth the final ounce of strength, financial, moral and mechanical, of the inventor. It requires a peculiarly high degree of optimism to be an inventor, for the very fact that he is engaged in work which if successful will overturn some established practice, or introduce some improvement, or change, in the established way of doing a certain thing, or will supply means for doing some new thing, raises the barrier of conservatism against the inventor and his work. The vast mass of humanity is satisfied with things as they are, and that mass forms an inert body against which the inventor must struggle after he has produced his invention.

The "conservatives" used to hang or burn an inventor occasionally in past ages. To-day, as always, they starve most of them to death.

In the development of the automobile, the world has come to think of the work of about a dozen great minds associated with major inventions or fundamental improvements, and to judge broadly that the automobile inventors have fared better than others.

So far as the immortal dozen are concerned, there is no doubt about their material success, although in no case has it measured up to what they deserve, but the general run of humanity overlooks the vast sad-faced army who contributed useful details and in some cases great inventions to the automobile art who never have been recognized.

Cugnot and Trevithick died in poverty. Evans abandoned the idea of developing the self-propelled vehicle. The British James died in the almshouse. Duryea is working for a modest living. Selden is still struggling with important details of the art, but has been soured and made misanthropic on account of his experience, and there are many others who have not received just due for their accomplishments.

On the other hand, material success in lavish measure has come to a few. Henry Ford is probably the most spectacular example, and Ford's actual contributions to the art were not fundamental. Winton,

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Wilkinson and Dyer have received a measure of recognition. But as a whole the automobile industry has rewarded its inventors quite as niggardly as any other branch of human development.

Invention is evidenced by letters patent issued to the inventor by the Government of a State. Under the laws of the United States, the inventor is entitled to the exclusive right to make, use and sell his invention for a term of seventeen years, and the laws of other countries are along generally similar lines. The idea of all patent law is to encourage inventiveness.

All inventors believe that the least of their efforts is worth a cool million. The slenderness of the foundation upon which they all base their ideas can be measured with astonishing exactness from an examination of the court records in the United States. Since the beginning of the gasoline automobile art, there have been just six patents sustained by the United States Circuit Court of Appeals and only three of those are still in force. While all have had important parts in the industry, not one applies to the vehicle itself. In addition to the six referred to, which are the Parsons patent, covering anti-skid chains, still in force; the Grant patent on solid tires, expired; the Canfield patent on chambered spark-plugs, recently expired; the Carlson patent on an obsolete type of engine cover plate; the Coleman patent on an electric self-starter, and the Perlman patent on demountable rims; there might be added the Selden patent, which was sustained in form by the United States Circuit Court of Appeals, pronounced the pioneer patent on the automobile vehicle, but declared to be not infringed.

Aside from those patents, the searcher will have difficulty in finding any that has been approved by the highest patent court. There are hundreds still in litigation, some of which have been upheld in their initial presentation and from which proceedings appeal has been taken by alleged infringers to the final tribunal. Others have been sustained and no appeal has been taken, but they are few indeed. One or two others have been accepted without final decision by the courts, as for instance the Dyer patent, covering the sliding, selective form of transmission mechanism under which most of the big manufacturers are licensed.

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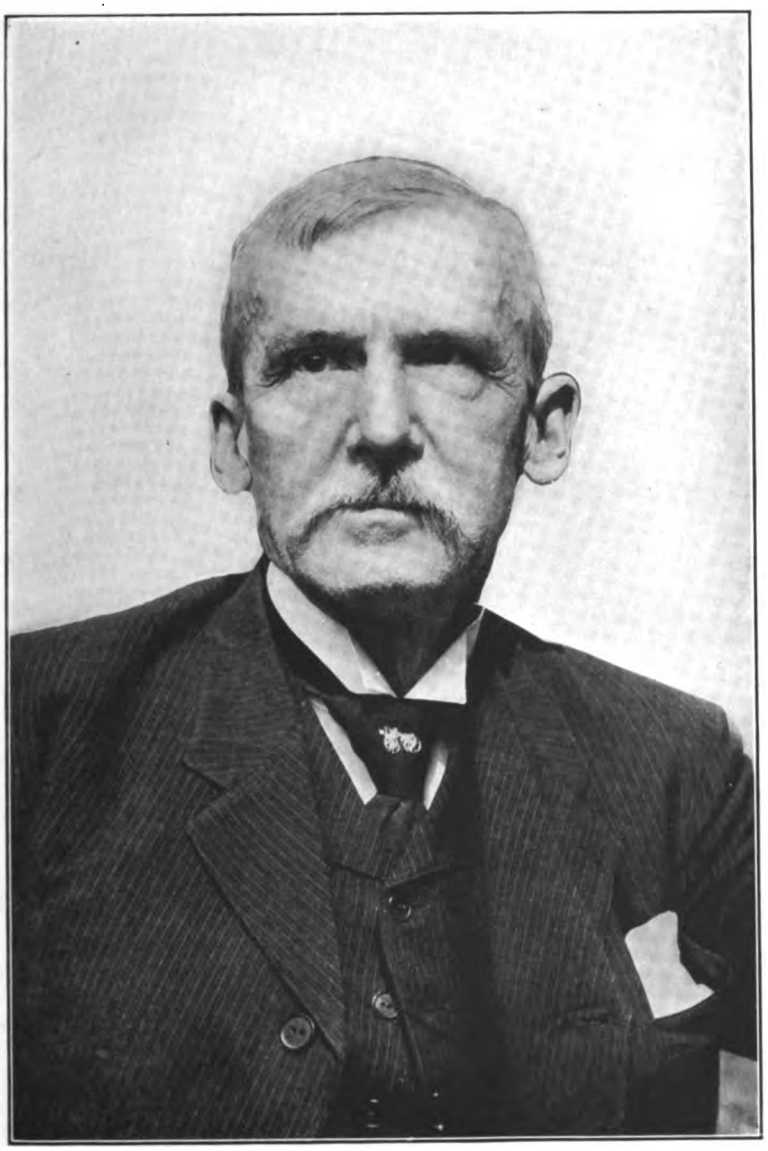

GEORGE BALDWIN SELDEN
Inventor of the Automobile.

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GEORGE BALDWIN SELDEN

As an example of the history of important automobile patents, the story of the patent of George Baldwin Selden, of Rochester, New York, is particularly illuminating. Selden has been maligned by former friends as well as foes. He was partially ostracized by his neighbors. He suffered and struggled on. According to the general view of Selden, the automobile industry has been disposed to say that he invented nothing, instructed nobody, held back the development of the industry through the initial enforcement of his patent by powerful interests, and in any event, received ample money returns to pay him for all his effort, if it did amount to something after all.

As a matter of cold, hard fact, this estimate of George B. Selden is unjust. The main fact to keep in mind in considering his work is that on May 8, 1879, he applied for a patent on the automobile vehicle which covers the essential principles of the modern automobile.

In order to appreciate the magnitude of Selden's accomplishment, one must consider what had been done and what was known about automobiles in that day. A diligent search has shown that the steam automobile was a reality, thus eliminating, from the problem of making a gasoline propelled vehicle, the necessity for inventing many of the elements that were already in existence.

The liquid hydro-carbon motor, heavy and uncertain in action and used for stationary work with very moderate success, was in existence.

The problem that confronted Selden, therefore, was to devise a vehicle, the motive power for which would have ten times the proportionate power required for a locomotive that ran on rails, while the bulk and weight of the motor had to be a mere fraction. He had to use some means by which the rapid revolution of the crankshaft could be converted into slower and more powerful motion of the driving wheels. And he did it.

Selden conceived the idea of the automobile, September 18, 1872, when he and a mechanic of Rochester ran a steam road roller on the hilly roads adjacent to that city. He recognized the impossibility of using steam in the same way it was used in the road roller, but the practical demonstration of the machine set him thinking on the possibility of using some form of mechanically-propelled vehicle in place of horse-drawn wagons.

He was a strange, shy youth, handicapped by a sunstroke in child-

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hood and weak lungs in early boyhood, but he had the advantage of a distinguished parentage and enough wealth to insure the best of care and a profound education. His father was the Hon. Henry R. Selden, a highly honored and erudite judge of the Court of Appeals of New York.

Young Selden attended the common schools of Clarkson, New York, and later the academy at St. Albans, Vermont. He entered the University of Rochester and pursued his studies for two years and then went to Yale. He followed the classical course when his inclination was toward science, and but for the sudden illness of his father, who was traveling at the time in Switzerland, during the commencement exercises of the Junior class at Yale, to which he belonged, Selden might never have become prominent in the field of automobile development.

After the examinations had been successfully passed, young Selden learned that his father was very ill and, abandoning Yale, he sailed for Europe immediately. When he returned, late the next fall, he found that under the rule at Yale he could not enter the Senior class and graduate with his former classmates.

Selden declined to fall back and lose a year, so, instead of continuing in the classical lines of study, he entered the Sheffield Scientific School, a branch of Yale, and remained there until his class was graduated.

With his natural inclination toward mechanics, this fragmentary course at Sheffield fixed Selden's subsequent career. Nevertheless, he finished his law course and was admitted to the bar in 1871 and to practice in the Federal courts in 1874.

Following his experience with the road roller in 1872, Selden began to investigate the problem of road locomotion, and had much the same sort of a life that all inventors live. He attended to his business sufficiently to supply his material needs, but devoted the bulk of his attention to his research and experimentation. He invented at various times devices that have proved valuable, but which are not associated with the growth and development of the automobile.

He fitted up a laboratory at his home and spent most of his time in it. He made a personal investigation of the degree of "draw-bar" pull required in vehicles to overcome the resistance of the common roads. He developed the idea of traction dogs to help overcome the losses in traction that he and others expected would develop when

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the force of a powerful motor should be exerted upon iron or steel-tired wagons.

Having marked out a very definite idea of the amount of power that would be needed to propel a road vehicle, he set about the construction of a motor that would do the work.

But after the three-cylinder engine had taken definite form in Selden's mind—in fact, after the crankshaft with its three throws had been made and the single-cylinder casting, air-pump and all the other parts had been manufactured and assembled in 1878 and after numerous trials of the engine had been made—Selden practically gave up the whole idea and with much disappointment abandoned, for the time at least, the idea of perfecting the application of his motor to the road vehicle.

He ran into one of those little difficulties that always have been the bane of invention. He found that the animal and vegetable lubricants, then in common use by machinists and which he had used in all his early experimentation, were not suitable for the new engine.

The fierce heat in the combustion chamber carbonized the oil on the cylinder walls and piston-head; he found that the oil decomposed and that the odor of the exhaust was overpoweringly disagreeable. Also, the lubricating service of the oils was far from satisfactory. Lubricant, that had proved fairly satisfactory for bearings and in the cylinders of steam engines, failed when applied to use in the new motor. The existing liquid hydro-carbon engines used in stationary work did not encounter the same trouble in the same degree, for a variety of reasons. But the main reason for Mr. Selden's abandonment of the automobile engine after all his labor and expense, was that the lubricant was inefficient and offensive.

One day in 1878 he heard that a Rochester company, the Vacuum Oil Company, had produced a heavy, clear, pure petroleum oil, which it designated by the name of "600 W Mineral." He immediately secured a few gallons of this oil and, without much hope that it would serve to solve the problem, took up his experiments where he had left off.

The mineral oil proved to be the turning point, and in the fall of 1915 Selden paid it the following remarkable tribute:

"In a broad sense, the mineral oil I secured subsequent to the final mechanical experiments on my motor in 1878 was the pivot upon which the practical success of the motor turned. To-day, all auto-

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mobiles use lubricants of similar character. I doubt that they could be operated without such lubricants."

Selden perfected his claims and specifications and prepared his application for letters patent, and having secured funds through the payment of a substantial fee by one of his clients, he filed the application in the patent office, May 8, 1879.

According to the sworn testimony taken in subsequent proceedings to establish the validity of his invention, Selden conceived the idea of a three-cylinder engine, after much experimenting. He actually built one of the cylinders, with its piston, connecting rod and crankshaft, and after a series of terrific struggles made it run.

He received little encouragement from anybody to go any further with the matter, even after the formal application had been filed and the trials of the inventor during the next fifteen years must have been enormous.

There always has been a doubt in the public mind as to why the application of Selden was not pushed vigorously so that the patent could have been issued soon after the filing date. There always has been much criticism of Selden concerning the great length of time that elapsed between the date of filing and the issuance of the patent.

It does seem absurd that the basic patent of a great phase of human progress could be held up for more than sixteen years, while the art covered by the patent was developing independently. The public opinion probably held much of justification in its attitude, but from Selden's point of view the situation was simply that if the patent issued and it was what he believed it to be, the basic patent of the new art, it would expire by limitation before he had a chance to profit by it.

Nearly any other inventor would have forced the issue of the patent as quickly as possible and taken a chance that he could interest capital to manufacture the vehicle. But George B. Selden was quite different. He knew from the bitter experience of others that the patentee, and particularly the pioneer patentee, seldom received any material rewards.

From the public's point of view it was undoubtedly right about its attitude toward Selden, but taking the inventor's viewpoint for a moment, one can see that there is every justification for legal delay in the innate probabilities of the case.

Why should any man devote years of study and experimentation to a certain line of pioneer work and then deliberately bar himself

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HERMAN F. CUNTZ, M. E.
Instrumental in bringing the Selden Patent to market.

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from the rewards of that work so that a big broad industry might reap the profits?

That is the other view of the case, and the outcome of the Selden litigation is ample proof of its soundness.

Selden deliberately went abroad seeking means to insure the manufacture of the automobile covered in his patent application, *before* he caused the issuance of the patent. Less astute and adroit inventors than Selden seek means of manufacture *after* the patent has been granted.

Equipped with a very practical knowledge of the law, he kept the application in force in the Patent Office, using perfectly legal and equitable practice that had been sustained for years by statute and procedure. Selden did nothing whatever that anybody else could not have done under similar circumstances, and his methods were always the approved and legal practice.

To do him belated justice it must be said that he tried earnestly to interest capital in his device, so that actual manufacturing might be taken up.

About the time that hazy and fragmentary reports of the success of the Benz automobile began to reach this country, Selden was negotiating with capitalists to manufacture his car. He experienced enormous difficulties in this search for money, because of the novelty of his undertaking.

Selden was deemed to be unbalanced by many of those he attempted to interest. One day in his office on Main Street, Rochester, he remarked to a visitor that they would both live to see the day when automobiles would be equally numerous out in Main Street, as the vehicles drawn by horses. The man to whom he was talking was a prominent and wealthy manufacturer and Selden was trying to persuade him to put $5,000 into the manufacture of a full-sized model, embodying his ideas.

They had been friendly for many years up to that moment, but when the manufacturer had remarked that Selden was crazy and that his words showed it and Selden had replied in his vitriolic fashion, relations were broken, never to be resumed.

About 1911 Selden met the manufacturer for the first time in nearly twenty-five years and the man said: "George, I guess you were right about those automobiles on Main Street."

As a kind of side-light on the character of Selden, it should be

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recorded that he replied: "And I was not so d—d crazy as you and a lot of fools thought me."

He never spoke to the man again.

In the middle and later 80's he interested six different individuals, or groups of men, who had the means to manufacture the car, and at the moment of consummation, as he believed, of contracts that would have insured an earlier development of the car in America than actually happened, there was a series of mishaps, each of which destroyed one of Selden's chances. One man on the verge of entering into such a contract died suddenly. Another went into bankruptcy. Sickness, accident and change of mind completed the list.

About 1890 rumors of the perfected form of the storage battery began to be circulated. Whatever interest, on the part of the public, there was in road locomotion drifted to the new idea, for the truth about electricity is attractive with regard to the motor vehicle and the publicity agents made it considerably more attractive by their conclusions. They told of the great mysterious power of the storage battery that was being perfected and predicted that the horseless wagon was about to burst upon mankind.

The impression created by this sort of publicity had its effect, not only upon the minds of the public, but also upon the intelligence of the men who had been approached, or who might be approached, by Selden with his proposal for capital. In fact, he found it even more difficult to enlist support, or interest, in his project at the time of the experimental work of Duryea and Haynes than it had been before the "electric superstition," as he terms it, began.

Even after the patent had been issued, November 5, 1895, Selden met with much trouble in securing the manufacture of his car, due, according to his idea, to the continuance of the exaggerated importance of electricity as motive power. It was not until November 4, 1899, that he actually closed the celebrated contract with the Columbia and Electric Vehicle Company, a New Jersey corporation, having a factory at Hartford, Connecticut.

The actual steps taken to get his patent into action were as follows: In 1897, the Pope Manufacturing Company of Hartford made a few electric automobiles, but could find no market for them in this country. This concern was a veteran of the bicycle industry and was among the early manufacturing companies to give attention to the motor propelled vehicle. It is related that after the first three cars had been

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completed and tested they were shipped to Newport, Rhode Island, with the idea that the assembled men and women of wealth at that resort might become interested in them. This was in the summer of 1897 and the company scored a complete failure even to market one of the cars.

Thereupon it was decided to seek sales abroad, and the three cars were crated and shipped to New York, where they were placed aboard the ill-fated *La Bourgogne,* which sank at sea. The company collected $3000 insurance on each of the cars, and thus it might be said that the first actual sale of American automobiles was from the Pope Manufacturing Company to the company that wrote the insurance on the automobiles. The Pope company, however, never made this claim, as a serious matter. In the spring of 1898 there were several electric taxicabs running in New York City.

The Electric Vehicle Company of New Jersey was formed September 27, 1897, the object of the incorporation being to serve as parent company to hold the stocks of other companies and to promote electric transportation. The Electric Vehicle Company, which was related by stock interests and otherwise in the Electric Storage Battery Company of Philadelphia, had the exclusive right to purchase batteries for its subsidiary vehicle companies. Under its parentage it was intended to form electric transportation companies all over the country and giant corporations were formed under the titles of the New York Transportation Company, the Pennsylvania Transportation Company, the New England Transportation Company and a large corporation to operate in Chicago.

The Pope Manufacturing Company eventually sold its electric vehicle business to the Columbia Automobile Company of New Jersey, a corporation formed by William C. Whitney, Anthony F. Brady, P. A. B. Widener, Thomas F. Ryan and the other capitalists interested with Whitney in developing the electric railroad and trolley systems of the country.

Whitney, a very far-sighted man, realized the importance of the electric automobile and, having examined the subject from all sides, became even more impressed with the possibilities of the gasoline car. He firmly believed that the automobile was an important phase of transportation and prepared in a methodical way to have a big part in its development.

Herman F. Cuntz, engineer and patent attorney, employed by

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Pope, learned of Selden's patent at the time of its issuance, and early in 1896, having been impressed with the importance of Selden's claims, he suggested to Pope and his associates that the patent should be acquired. Cuntz met and talked with Selden several times and repeatedly urged his employers to secure it, or a broad license under it.

In the spring of 1899, William A. Redding, counsel for the Pope interests, entered into negotiations with Selden to purchase the right to manufacture under his patent and was much impressed with the sweeping character of the claims made by Selden and allowed by the Patent Office.

So Whitney formed the Columbia Automobile Company and the Pope company sold its automobile business to the new corporation. Then the Columbia & Electric Vehicle Company of New Jersey was formed and took over the assets of the Columbia Automobile Company. On November 4, 1899, the company made the celebrated license agreement by which it secured exclusive rights in Selden's patent.

About this time Whitney and his associates had secured a substantial interest in the Electric Storage Battery Company, of Philadelphia, of which Isaac L. Rice was president. Rice was also president of the Electric Vehicle Company, but through the negotiations with Whitney he was persuaded to retire and the control of both corporations was assumed by Whitney.

The Electric Vehicle Company thereupon absorbed the Columbia & Electric Vehicle Company with all its assets, including the Selden license agreement, the deal being closed June 26, 1900.

The leap of the Electric Vehicle Company to the front as the most powerful element in the automobile field was marked by the vigorous enforcement of the Selden patent and a complaint alleging infringement of the patent on the part of the Winton Motor Carriage Company of Cleveland was drawn up and filed.

The Winton Company demurred, setting up all the defenses possible under that form of procedure, and Judge Coxe of the United States District Court overruled the demurrer in November, 1900, sustaining the patent in general terms by his action and the accompanying dicta. The suit was carried along, taking testimony until 1903, when a movement was instituted by George H. Day and others to form the Association of Licensed Automobile Manufacturers. This was accomplished March 5, 1903, and the Winton Company and nine others signed the agreement as charter members.

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The Selden patent was the foundation of the association. Under the agreement, the licensed companies agreeing to pay as royalty 1¼ per cent. of the retail list price of all cars sold by them, to the Electric Vehicle Company, and the company agreed to pay two-fifths of this sum to the Association of Licensed Automobile Manufacturers. The Electric Vehicle Company, as successor to the original licensee, had an agreement with Selden as to the amount of the percentage he should receive.

The industry made rapid strides subsequent to the formation of the A. L. A. M. and in a short time the 1¼ per cent. payment began to make a tremendous volume of money. For instance, early in 1906 it was sworn that there had been made 41,043 cars under the patent. If these cars averaged $1,000 each in retail sales price, and they actually exceeded that figure by several hundred dollars, the percentage of the association up to that time must have amounted to more than $500,000. In fact, the royalties were so large that they proved to be burdensome to the industry. There were several smart debates over this matter within the A. L. A. M., and Henry B. Joy, president of the Packard Motor Car Company, headed one movement that might have brought the organization to grief, if his words had fallen unheeded. Joy protested that there was no legitimate reason for such a large tax on manufacture and he was well within the right in making the protest. The association listened to Mr. Joy and his presentation of the matter was so convincing that the members protested to the Electric Vehicle Company to cut down the royalty charge against the companies to 1 per cent. This new rate was maintained for some time, when the volume became even more dangerous than it had been before the initial reduction. Joy and others by threatening revolt secured further reduction and finally the rate was made four-fifths of 1 per cent.

When the annual output of licensed cars passed the total of $100,000,000 a year, the income of the A. L. A. M. was positively burdensome to the licensees. Long before then a supplementary agreement had been reached by all the parties interested, that only $150,000 annually should be paid to the Electric Vehicle Company as its share in the royalties, the remainder being placed in the general fund of the association.

No public figures ever have been given out with reference to the total royalties paid by the manufacturers on account of the Selden patent, but the sum is very substantial. It is likely that the inventor

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received all told not far from $200,000 gross, but there is no sure way of discovering the actual figure unless Selden wishes to disclose it.

George H. Day, founder of the A. L. A. M., and president of the original company to which Selden granted the license, was one of the real diplomats developed by the automobile industry.

The most spectacular event of automobile history was the litigation between Selden and Ford, which was really one of the most important legal battles ever fought. Ford did not join the A. L. A. M., but continued the manufacture of his car.

On October 21, 1903, the original suit was filed against C. A. Duerr & Company, New York agents of the Ford Motor Company, and the manufacturing company was joined as party defendant. The suit was brought at the request of the A. L. A. M. in the name of the Electric Vehicle Company and Selden in the Circuit Court of the United States, Southern District of New York.

The bill in equity, which was drawn by Fred S. Betts and William A. Redding, and the firm of Betts, Betts, Sheffield & Betts, set out the claims of the patent, which was numbered 549,160; alleged infringement and conspiracy on the part of the defendants and prayed for a sweeping injunction and an accounting for profits as well as the imposition of statutory penalties.

R. A. Parker, of Detroit, an exceedingly able and adroit patent attorney, and William L. Eaton, a representative of Cardozo & Nathan, were the first attorneys to conduct proceedings for the defense. Later, numerous other legal lights were assembled by both sides and during the nearly eight years that the case was in the courts the array of talent presented was most impressive.

There never was a patent suit more exhaustively treated. In fact, the treatment was so exhaustive, not to say exhausting, that Judge Charles M. Hough declared in his opinion on the case, that the defects of the law in allowing such a mass of testimony, more than half of which was utterly worthless, had been flagrantly exemplified in the suit. As a matter of fact, the record of testimony makes thirty-six large volumes, a good part of which was the subject of legal objections at the time the depositions were made, many of which would have been sustained if the hearings had been conducted in open court and subject to the rules of evidence. The prolixity of the Selden litigation probably served at least one very salutary purpose, for on the recommendation of former President William H. Taft, while Chief Magis-

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trate, the present simplified equity rules were ordained by the Supreme Court and as a direct result, it is now possible to reach a definite, final ruling on a matter in equity with little loss of time and for comparatively little money. The suggestions of Judge Hough in the Selden case have been crystallized into new equity rules of the Supreme Court of the United States.

The complainants made out a prima facie case, proved the patent and the taking of testimony began. Volume after volume of record was piled up and the hearings dragged along until the summer of 1909.

In the meantime, an automobile embodying the claims of the patent had been constructed to prove that it was possible for it to run. Selden tells an interesting story in connection with the mechanical parts of his first motor. It appears that in 1878, when he had progressed to the stage where it was necessary to connect up the cylinder with the propelling mechanism, nobody in Rochester had the facilities for making a crankshaft, and he was obliged to give the job to a Buffalo foundry and machine shop. Selden urged the manufacturer to hasten the work as much as possible and sent along blue-prints and specifications for the shaft. There was some delay and Selden became impatient and wrote to the manufacturers to make the shaft without further delay.

In the course of time the shaft finally made its appearance, but Selden did not have to use a micrometer to discover that instead of having the three throws at angles of 120 degrees to one another, there was an angle of 127 degrees between two pairs of throws and only 106 degrees between the other throws.

As may be imagined, the timing of that motor must have been quite an involved job. Likewise, at very best, the progress of the car must have been somewhat jerky and uncertain. With a perfect crankshaft, any car of the date of Selden's patent would have had a sufficiently hard time to run, and it is by no means certain that the deficiencies of the shaft for Selden's car helped it mechanically.

The original Selden car was hard to make go. It did run, more or less—just about enough to justify the principles involved, without doing much to prove the practice. One explanation of the car's poor performance was the error of seven degrees in two of the crankshaft throws, a fact which is here published for the first time.

The expert testimony taken in the case was unusually complete,

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the complainants calling Dugald Clerk, the British engineer, considered the highest authority available on the gasoline engine, and the defense calling, among others, on Charles E. Duryea, the American pioneer.

Clerk's testimony established the right of Selden to a high degree of inventiveness, but in his treatise on the gas engine, published in 1900, there is a curious discrepancy in the date that he fixes upon which the Benz engine ran in satisfactory style. Clerk says in the second volume of his work, page 480, that the Benz tricycle ran at seven miles an hour in 1878 and repeats the statement in substance on page 331 of the same volume. The Benz company never made the serious claim that the tricycle ran before 1883, and it is likely that the 1878 date used in Clerk's work was a slip or typographical error. However, there is a curious look to the fact that the error, if it is an error, was repeated.

The testimony taken by the defense and introduced in this case does not appear to be at all conclusive on any material point. Some of the imported witnesses were swamped in cross-examination, particularly the expert who testified to the use of liquid hydro-carbon fuel in a French machine about the time of the commercial discovery of gasoline in the United States. Manifestly, if there was no gasoline in France and no means of getting any except from the United States, where it was regarded largely as a waste product, and as the United States was in the midst of the Civil War and not particularly active in marketing its products abroad, the conclusion was that probably the witness was mistaken about his dates and possibly about the fact itself.

An interesting story is told of how Charles E. Duryea forecasted the action of the United States Circuit Court of Appeals. Duryea got hold of a copy of the Selden patent soon after it was issued in 1895 and upon reading it over carefully, he exclaimed: "Why this patent covers only the Brayton type of motor."

Duryea was quite right, from the viewpoint of the court of last resort. He had searched the records for a usable type of gasoline engine to embody in his work and he knew the state of the art. He had a vision of something that if it had been fully used might have changed the time of the development of the automobile to quite a material extent.

Opinions are divided about the actual service to the industry of

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the Selden patent even after it was granted. There are those who hold that the confidence inspired in investors through the strength and sweeping character of the claims of the patent and the vigorousness of the manufacturers who allied themselves with the A. L. A. M. was more than counterbalanced by the deterrent effect the patent may have had on manufacture outside the fold of that organization.

However, the progress of the industry between 1903 and 1915 so far exceeds anything that the human race has done in any similar period of history that it is hard to conceive of any greater degree of speed and progress than was actually made. Nevertheless, a proven patent covering the line of development and enforced by a strong combination of licensees, undoubtedly did act as a deterrent, even though we are unable to measure the extent of the loss because we have no standard by which to reach conclusions.

Duryea forecasted the action of the final court sixteen years before the court rendered its opinion. With the same tenacity that has marked his retention of the buggyaut, he held to his original opinion. Duryea has done a lot for the industry, and the credit for being able to discern the grounds upon which the high Federal court was to destroy the basic patent of the motor art sixteen years later, must be given to him.

At last the whole mass of testimony to be presented to the court was completed and the case was set down for argument before Judge Hough in June, 1909. The presentation was made at length and the court rendered its opinion without nearly so much delay as might have been expected from the length of the record and the congested condition that always maintained at that period in the Federal courts.

Judge Hough's opinion, rendered in September, 1909, sustained the patent in every particular; pronounced Selden the pioneer of the art and granted the prayer of the complainants for an injunction and accounting.

After the filing of the suit in 1903, John Wanamaker, O. J. Gude, Panhard & Levassor and others had been joined in the action as defendants and the decree of the court included all of them.

The result of Hough's decision was to strengthen the hands of the A. L. A. M. and to render it dangerous for any one to run an infringing automobile, but Ford soon took steps to protect the users of his cars by taking an appeal from the decision of Judge Hough and depositing a bond with the court to cover the damages of the com-

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plainants while the case pended in the United States Circuit Court of Appeals.

The action, however, had little effect upon the manufacturing activity of Ford, for during the time, about sixteen months, that the case was pending on appeal, the company laid the foundations for the immense commercial increase in its business that has developed since that time. It may have been that it would have been greater if the decision of Judge Hough had been given in the opposite strain, but it is difficult to see where the increase could have shown itself. The Ford company to-day is entirely unique among human enterprises. If it has been the victim of arrested development, through the opinion of the lower court in the Selden case, the average human mind can not conceive with readiness that there are any traces of such an ailment.

For a year after the decision the case was prepared on both sides for presentation to the full bench of the upper court, Judges Ward, Lacombe and Noyes. Judge Lacombe had been sitting in automobile patent suits for several years and had given the whole subject of automobile patent litigation profound and patient thought, but Judge Noyes wrote the final opinion, which ranks as one of the most elaborate engineering documents ever filed in court. It also stands out as a remarkable psychological essay, taking into consideration the broad matters of public policy that underlie every really constructive step in progress.

While nobody knows what passes in the mind of a judge or court, save as conclusions are presented in the form of opinions and decrees, there are several things about the Selden case that make interesting speculation. Judge Noyes, as the mouthpiece of the court, approaching the subject with open mind, found two records of litigation in which the patent was subject matter, both of which sustained it. The first was on a point, or rather five points of law, and was raised on demurrer. The court had overruled the demurrer and in dicta, attached to its opinion, had stated that there appeared to be valid grounds for sustaining the patent and pronouncing the invention contained in it to be valid invention, within the meaning of the statute. The other decision was in the case that had come before the court on appeal.

He found that the patent had been held, for one cause or another, in the Patent Office for sixteen years after application for it had been filed. He had ample proof before him that the patent possessed nov-

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elty and invention—in fact, patentability. But he had the evidence that showed clearly that the motor-propelled road vehicle was not new and that the gasoline engine was not new, but the improvement of the gasoline engine and its combination with the older elements of the road vehicle was what he had to measure by the rules of equity.

The court faced the problem at a time when there was a concerted protest against industrial combinations of any kind. Industrial mergers were in disfavor with the public. The cry of trusts had been raised all over the land. Remedial action in the courts against numerous great combinations of business were then pending. Of course, it is not to be assumed that these prosecutions carried any weight with the court, and the fact is merely stated to show the condition of the public mind on the matter.

The agitation of the period was quite widespread against everything in the nature of the combination of competitors, in any kind of an association. The A. L. A. M. had not escaped more or less of this character of criticism. In fact, it did not deny that the rights and privileges conferred by the constitution and law on patentees and their assigns were valuable and let it be known that those held by the association would be enforced if the courts upheld them. The position of the association in this matter is quite clear and not at all repugnant to the laws and customs.

But there was a public clamor against the trusts.

The Selden patent had been kept under cover in the Patent Office for sixteen years and the defense had not overlooked an opportunity to tell why it had been so covered. No allowance was made by the defendants' attorneys for the fact that if the patent had been issued, say in 1880, it would have expired by limitation in 1897, some months before the patentee could have collected a royalty check from Alexander Winton for the sale of his first car in March, 1898.

The fact that the patent was so covered up was reiterated again and again by the defense in urging that the art had not been improved through a discovery that was kept under lock and seal in the archives of the United States government for sixteen long years.

And then there was this other phase of the situation: Selden knew all about the Brayton two-cycle engine. His claims and specifications included its principles, because they were broad enough to include almost anything in the gasoline engine art. But in the construction of his model, the court saw that in making the engine Selden had used

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the air-cooled, two-cycle type, despite the fact that any kind of a gasoline motor could have been used under the claims.

Even those who took a hostile view of Selden and his work, but who were not actively arrayed against him in the court proceedings, agree that up to that point it would seem that the patent must be sustained, but right there appeared still another factor that may or may not have been the turning point against the patent. At least, it is interesting to consider it at this time.

During the proceedings a note-book and diary of the inventor were introduced in evidence showing that after the art of Otto had been disclosed and Selden, apparently had enjoyed an opportunity to examine it, he made an entry in the diary, referring to the Otto four-cycle engine, in which he wrote: "This is another of those d—d Dutch engines."

As the Otto type of motor, suitable for stationary work, had been invented prior to Selden's filing date, and as it was to be assumed that he knew about the art, there is a possibility that the apparently irrelevant notation in the diary destroyed the force of the patent.

The reasoning is clear enough if the facts are admitted. Selden knew about Brayton and his work and could have known about Daimler's progress. But he built an engine that resembled Brayton's and commented contemptuously on the work of Daimler. From that state of facts it is no violent assumption to conclude that Selden intended his device to use the principles of Brayton, and did not intend it to use the Otto engine.

At any rate, Judge Noyes, in the opinion of the court, rendered during the National Automobile Show week in New York in 1911, held that the patent was valid, but that Ford did not infringe, because the patent described an engine of the Brayton type while the defendants and almost all modern automobile makers used the engine of the Otto type.

The decree, of course, removed the raison d'etre for the association. Its membership, at the time of the court decision, included the makers of 90 per cent. of American automobiles. Under the agreement, through which they had become members of the A. L. A. M., there was no way to withdraw from it during the life of the patent, and it had proved such a powerful constructive influence that it could not be abandoned even when the patent was emasculated. But the decree

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HENRY FORD
President Ford Motor Company.

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put an end to Selden's royalties and largely to his influence on the industry.

The human interest angle in Selden's personality has been overlooked very largely, yet he is a very human old gentleman. He experienced a run of bad and good luck such as is seldom the lot of man. His patent is now growing musty, although it passed from the scene of activity only a short time ago. He was very fortunate in being able to enjoy an income from the patent for so many years and very unfortunate in losing that income. If the patent had been sustained and if he had collected a gross royalty of one-fifth of 1 per cent. on the cars made up to November 5, 1912, which was the date upon which the patent expired by limitation, his receipts would have placed him distressingly high in the millionaire class.

As it is, it is likely that he has enough to meet his wants. He is cool and aloof in his attitude toward his neighbors, feeling conscious that his inventiveness, his religious peculiarities and his temperamental flaws have set him apart from his fellows. But underneath his exterior gruffness George B. Selden is warmly interested in his city and the automobile industry. In fact, it is not unlikely that he may announce before this work has gone to press quite as radical and far-reaching a discovery as that covered by Letters Patent 549,160.

HENRY FORD

The name of Henry Ford is known and his personality is respected wherever civilized man dwells. As head of the company that has produced or has scheduled for current production something like $700,000,000 of automobiles in eleven years, there can be no question about his rank in the industry. As the chief of 20,000 workmen, most of whom he developed from mere laborers to the grade of skilled mechanics, each deemed worthy of mechanics' wages but schooled to perform only a single operation, he has gained fame.

The world is interested in Henry Ford as a pacificist, educator and philanthropist, but the automobile industry recognizes in Ford a scientist, a bulldog fighter and a manufacturer par excellence.

Ford invented and built with his own hands a two-cylinder, four-cycle gasoline car that ran at the rate of twenty-five miles an hour in the spring of 1893. That places him so close to the top of the list of

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American automobile inventors that there is a doubt as to exactly how he ranks. From the best data available as to his status in the list, he should be credited with making the second gasoline car that ran in the United States. Duryea certainly built and ran a car in 1893 and tried out his Buggyaut, commenced in 1891, quite extensively before the date of Ford's first car, but the weight of the testimony is that Ford was second.

He fought the Selden patent to a standstill, without proving anticipation of its claims.

His car has been the strongest educational force the industry has produced, because the ranks of motorists are increased from the bottom and Ford cars are the first cars purchased by entries into the motor field in a large percentage of cases. The array of 1,500,000 Ford cars and the service they have done needs no emphasis here.

Henry Ford and the Ford car are the best advertisements the automobile industry has enjoyed. Speaking broadly, their value to the rest of the industry is incalculable.

Of full medium height, Mr. Ford is slenderly built but sinewy as hickory. Equipped with meager primary schooling, he has taken all the degrees conferred by the University of the World.

There has been an immense amount of flub-dub written about Ford's hardships; his luck and his genius, but the only real hardship he ever had was that he chose to work hard. He was successful because he worked out an important problem at the right time and his genius may be described as the logical sequence of the hard work and success.

Ford's genius rests upon his ability and willingness to do an astounding amount of work. He made a monumental success because he did the work and expended the intelligent effort at the right time, and then kept right on expending intelligent effort until the whole world recognized it.

Ford was the eldest of three sons and three daughters, born to William Ford, native of Ireland but of English blood, who emigrated to this country and settled eight miles west of Detroit, Michigan, in 1847. The young Irish-English immigrant was a man of strong personality and was a steady and moderately successful farmer. He married Mary Litogot some years after reaching Michigan, and Henry Ford was born July 30, 1863.

A great storm of criticism and protest has been raised concerning the attitude of Mr. Ford toward war. Opinions may differ according

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to the partizanship of those who hold them, but the stern position assumed by Ford is perfectly clear and logical from his point of view. Hatred of war comes naturally to Henry Ford, for he was born to the sound of fife and drum. His mother listened to the tramp of armed hosts and heard the dismal music of the funeral bands; the wailing bugle call of "Taps" over the graves of fallen warriors. She saw an endless line of maimed men come back from the battle front and she gave to Henry Ford an inherited aversion to war that is as deeply ingrained in his being as it is possible for anything to be.

There is nothing in his attitude to show that he fears war—he simply hates it.

The boy Henry was a baby until the end of the struggle between the states, and his childhood was little different from that of the average farmer boy, where there is a measure of prosperity. For the father was not poor. The boy had enough to eat and wear and a comfortable home in which to live. He had to work hard and long as soon as he was able. But that is the lot of all farmer boys. He was no laggard and between the farm work and the rudimentary schooling he received, he found time to rig up a little shop on the farm where he had a vise, a lathe and a rude forge, as well as tool equipment of miscellaneous kinds. He fairly reveled in mechanics and sought out repair work, mostly for the love of the work itself rather than for any money returns that might result.

At sixteen, he was a slender but nearly full-grown man and had developed considerable skill in mechanical work. So much interested was the boy in this line of industry that he and his father disagreed. Henry said he wanted to be a mechanic and his father insisted that he should be a farmer. The result was that Henry went to Detroit and got a job with Flower Brothers, general machinists and steam engine builders. He worked at night as a helper and laborer in the machine shop and gained a vivid conception of the application of machinery. At the end of nine months he secured a better position with the Dry Dock Company, a concern with a larger machine shop than Flower Brothers, and remained with his new employer for two years.

He became interested in steam engines while still on the farm, and the part of farm work that he really liked was during the seasons when the farm required the service of steam engines. Ford was in his glory while serving as helper about the harvesting machines. When

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he was working in the Detroit machine shops he continued his interest in steam engines and did quite a lot of experimenting before he was nineteen years old.

Before his twentieth birthday, Ford left the Dry Dock company and was employed as "road expert" by the Michigan state agent of George Westinghouse & Company, of Schenectady, New York, and put in several years in the service of that company, constantly in touch with the engine and constantly learning more about men and affairs.

His father never had become reconciled to Henry's defection from the farm, and considered it more or less of a disgrace that his eldest son should work with his hands at anything besides agriculture, and in a final effort to "redeem" the young man from a life of that sort, he presented his son with a heavily "timbered forty" near the old farm.

Ford dutifully abandoned his job with the Westinghouse people and made a careful inspection of his landed estate. He found that the timber was merchantable and of good quality and thereupon he rigged up a sawmill, cleared the land and marketed the lumber, spending some time in denuding the forty-acre lot.

Ford was a farmer with mechanical leanings in 1887, but his timbering operations had been moderately profitable, and he had fitted up a shop on his farm in which the first Ford car was built. He married Clara J. Bryant in 1887.

The first Ford was a steamer, designed to be run with a single-cylinder engine 2 by 2 inches from a boiler that developed from 250 to 400 pounds pressure per square inch. The car was never completed and was abandoned in 1889.

Ford gave up farming about the same time he abandoned work on his first car and removed to Detroit, where he got a job at $45 a month for 12 hours' work a day with the Detroit Edison Illuminating Company. He was raised to $75 a month in 90 days and was made chief engineer at $100 and then $125 per month, remaining with the company for seven years.

In the early days of his employment with the illuminating company he only worked 12 hours a day; thus leaving him 12 hours for labor at home. But when he was made chief engineer he was supposed to be on the job all the time. Of course the company did not require his presence all the time, and he was able to spend a few hours a day in work at home.

It was the time thus allowed Ford that he used to design and

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build the first Ford gasoline car. In his leisure (?) moments he constructed a two-cylinder, four-cycle water-cooled motor, in which the cylinders were placed side by side. The cylinders measured 2 9/16 inches in diameter by 6 inches stroke. He patiently constructed the running gear and the means for transmitting the power of the motor to the driving wheels and early in 1893 gave the car its road trial. The car was not a perfect automobile by any means, but it was a long step in advance of anything that had been seen in America up to that time. It ran swiftly and Ford made twenty-five miles an hour surely, perhaps as much as thirty.

While still connected with the illuminating company he started work on his second car in 1895, a two-cylinder, four-cycle motor measuring 4 by 4. This car was on the road in 1898 and performed very satisfactorily, considering the date and stage of development of the art at that period.

Ford organized the Detroit Automobile Company, a corporation capitalized at $50,000, of which he owned one-sixth and was employed by the company as chief engineer at $100 per month. The company built two or three cars, but in 1901 Ford left it and purchased a machine shop of his own nearby. The Detroit Automobile Company soon became the Cadillac Automobile Company, which has now developed into the Cadillac Motor Car Company, one of the largest motor car factories and one of the most successful in the world.

In 1902 Ford built a car of what is now considered standard gauge, 90-inch wheelbase driven by a double-opposed engine of two 4 by 4 cylinders, using his own resources, and then organized the Ford Motor Company, incorporated, with a capitalization of $100,000. The first modern Ford car built by this company was on the road in June, 1903.

Ford owned 25½ per cent. of the stock of the original company, which was a commercial and financial success from the start. But he appreciated that his interest in the company was too small viewed from every standpoint he could assume, providing the enterprise had the qualifications for a great success and so he obtained $175,000, and purchased 25½ per cent. more of the stock, making his holdings amount to 51 per cent. of the total. Soon afterward he paid 700 per cent. of its face value for 7½ per cent. more of the stock, making 58½ per cent. all told, which is the extent of his interest in the present vast company.

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Ford has a commanding interest in the Canadian and other subsidiaries and is one of the world's richest men.

The success of the company has been due to the demand for the automobile, which was supplied by Ford in a different way and on a larger scale than others. In detail, the system of sales which contemplates 90 per cent. of cash on delivery and 10 per cent. of factory branch business, has worked out profitably and efficiently. There never has been much of a problem of storing surplus stock in the form of completed cars by the Ford concern. The demand always has kept pace with the utmost production in the busy season and has been so nearly even with the capacity output in the dull seasons that the locking up of capital and the use of space for storage have been minor problems. Rather has the difficulty been in the opposite direction.

One of the little economies that mean millions introduced by Ford is the plan of saving on railroad freight. It was discovered that the shipment of completed cars from factory to distributer cost more than the shipment of parts and assembled units from the main source of production to certain assembly points, because completed cars are bulky in comparison with their weight and consequently take a higher classification in the estimate of the railroads. It was much cheaper to ship ten carloads of parts than ten carloads of cars, particularly when the parts would make many times the number of cars that could be packed into ten railroad freight cars. Consequently assembly plants were installed at various appropriate and convenient places and the finished parts are shipped to such plants and made up for the trade. This branch of the business is in addition to the activity of the great main plant at Highland Park, Detroit.

Luck, in the general sense of the term, has had little to do with his success and apparently he does not believe that other factors besides hard intelligent, and successful work should form the basis of success in others.

In twenty-five years he has risen from a wage position where his pay was less than that of a laborer in his works to the pinnacle of fame and fortune and his history may be truly called "The Romance of the Automobile Industry."

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HARRY PARSONS

Selden's patent has been rated one of the financially successful efforts of the automobile art, despite its destruction as a producer of royalties, but the history of other patents that came along at the right time and withstood the test of the courts makes Selden's invention look small indeed as a money maker.

The list of thoroughly adjudicated patents now alive that have been fought and sustained to a final decision in the United States Circuit Court of Appeals, contains only three names. The senior is the Parsons patent, issued to Harry Parsons, a British engineer, March 24, 1903. Selden patented a whole automobile and Parsons merely devised an arrangement of chains that would prevent the automobile from skidding. Selden's patent was killed, while that of Parsons was sustained in forty or more sharply contested actions in which the Weed Chain Tire Grip Company, now the American Chain Company, which controls the American rights to the Parsons patent, was generally represented by Frederick S. Duncan, assisted by James N. Catlow of New York.

The reasoning involved in the triumph of a detail and the defeat of the main idea is perfectly clear and obvious curious as it may seem to the casual observer. The road vehicle propelled by motor power was not new in its main idea when it was patented. A few, and a very few details of automobile practice as it exists to-day, remained to be discovered and Parsons was one of the elect to develop such an idea.

In one comparatively insignificant device he added from three weeks to a month to the possibilities of every automobile's service during a year. That means an average of over 600 miles of travel per car per year. Automobiles only deliver a certain amount of mileage and if the delivery has been satisfactory they are almost invariably replaced. Therefore, through the invention of Parsons, a market for one-twelfth of the total output of automobiles whatever it may be has been afforded.

Surely, in that view of the matter, the importance of seemingly small detail takes on an entirely new aspect.

Parsons has made a fortune out of his patent. Quiet and unassuming in his manner, before he attained prominence, he has not changed in prosperity.

He was fortunate in securing the right kind of backing and Ameri-

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can representation, for he was far-seeing enough to realize that the great volume of business would be done in the United States and the fierce legal battles prove that he needed all the ammunition he could get.

His idea did not meet with instant acceptance, in fact, Parsons tried to market his invention in the United States for months without success. He tried to sell licenses and finally agreed at one time to accept $5,000 for all his rights. Even this deal failed of consummation and, almost disheartened the inventor returned to England.

But prior to sailing he appointed American representatives on the bare chance that a sale might be effected.

Frederick S. Duncan and James N. Catlow were the legal representatives of Parsons and sometime after the departure of the patentee, they learned that a chain non-skid device, almost identical with the invention of Parsons was being manufactured by the Weed Chain Tire Grip Company, under patent granted subsequent to the Parsons patent to Harry S. Weed.

The Weed Company negotiated for the American rights and these were eventually granted.

The Weed patent covered practically the same ground as that of Parsons but was worked out entirely independent of the British inventor. The length of time by which Parsons anticipated Weed was very brief.

TIRE CHAINS

Perhaps no automobile accessory has had a more interesting or has played a more important part in the development of the automobile than the tire chain, or chain grip, as it is variously called.

From the appearance of the first automobile down to the introduction in this country of the chain grip in 1904, the automobile was essentially a fair-weather machine. Skidding was so frequent an occurrence and produced such disastrous results that substantially the universal custom was to lay up machines for the winter and long distance touring was considered out of the question, particularly during seasons when storms were likely to be encountered. The trade papers were full of accidents due to the skidding of automobiles which was recognized as a great danger and the greatest drawback in the use of the automobile.

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Various attempts were made to overcome the skidding, but these resulted in failures and up to the time of the invention of the tire chain no satisfactory device was proposed that would effectively prevent the skidding of automobiles without at the same time having so destructive an effect upon the tires as to render the device impractical. During the nineties, when the use of the bicycle was at its height, numerous attempts were made to equip the pneumatic tires of bicycles with anti-slip devices. Some of these were of fabric and others of metal. It was found that the fabric devices would not stand the wear and that the metal devices would deprive the tire of its resiliency and would soon destroy the tire itself. After the introduction of the automobile and the general recognition of the necessity for an effective anti-skid device, various attempts were made by the early manufacturers of automobiles to provide either leather, canvas or metal traction devices, but invariably these devices proved impracticable. In all instances these devices, whether intended to be permanently connected with the tire or to be detachable therefrom, were so designed as to be held stationary on the tire. Previous experience with the bicycle anti-skid device had demonstrated that any motion on the tire of the structures *then* devised was undesirable. It had, however, also been demonstrated that the metal devices that had been tried in connection with bicycle tires would quickly destroy the tire or deprive it of resiliency. In the case of the automobile the problem involved was much more difficult than the bicycle owing to the great weights and strains involved with the automobile. After many devices had been tried and discarded, the trade generally came to the conclusion that a satisfactory anti-skid device for automobiles could not be made and for a period of years the automobile was therefore, as above pointed out, used almost entirely as a fair weather machine. In sudden rain storms, or other emergencies, various makeshifts were employed, such as winding ropes or pieces of chain around the tires, but these expedients were, of course, temporary and unsatisfactory and for many years no commercial practical device appeared.

In 1904 the Weed Chain Tire Grip was put upon the market by the Weed Chain Tire Grip Company, of which Walter B. Lashar of Bridgeport, Connecticut, was the originator and of which he still remains the President. This device was based upon United States patent No. 723,299 of March 24, 1903, issued to Harry Parsons, a British engineer who had organized the Parsons Non-Skid Com-

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pany, Limited, to manufacture and sell his invention in England and continental Europe. This device was at once recognized by the trade and by the automobile public as solving all of the problems of skidding. It effectively prevented the slipping and sliding of the automobile and at the same time it neither took away the resiliency of the pneumatic tire nor subjected the same to any appreciable injury. Almost immediately the device went into widespread use in this country as well as in England and within a short time it became an indispensable accessory for automobilists. The use of the Weed chain soon demonstrated that there was no longer danger in the winter use of automobiles or in long tours even in stormy weather. Recognizing this fact the manufacturers of automobiles changed their designs, and limousines and touring cars intended for all-the-year-round use took the place of the old fair-weather machines. Leading automobile engineers have testified in various proceedings under the Parsons Patent that the development of the modern touring car and of the all-year-round machine was made possible and was in considerable measure due to the tire chain making possible the use of automobiles in stormy weather and during the winter. So necessary is this device now considered for the comfort and safety of automobilists that practically every automobile is equipped with one or more pairs and the Safety First Societies advise its use under all wet and slippery road conditions.

The tire chain invented by Parsons and developed in this country by the Weed Chain Tire Grip Company involved radical departures from existing ideas. At the time of its introduction, the bicycle and automobile art believed that traction could be obtained only by means of devices that were made rigid with the wheel and that pried into the ground like the projections on the rim of an agricultural or traction engine and the conclusion had also been reached that such construction was not feasible in connection with pneumatic or other rubber tires, inasmuch as the metal traction parts would abrade the surface of the tire and would cause internal injury by separation of the layers of fabric composing the tire. It was also supposed that creeping or shifting of traction devices on the tire was undesirable, and this indeed was the fact with all devices prior to Parsons. He, however, conceived of the idea that effective traction could be obtained and slipping and skidding prevented by a device that was loose on the wheel and was free to creep thereon, and he also discovered that

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even though his device were made of metal it would, *if given sufficient flexibility and if in other respects properly constructed,* in nowise injure the tire when creeping around it. Indeed, he found that creeping of a device constructed in accordance with his invention would be highly beneficial. An interesting story is told of the origin of the Parsons invention. He was endeavoring to start his automobile on a slippery muddy road. The driving wheels instead of getting a proper purchase on the roadbed spun around and Parsons, in order to overcome this, threw some handfuls of loose gravel under the front of his wheels, thus giving the tires a purchase on the roadbed and allowing the car to start with ease. The thought occurred to Parsons that if he could continually keep scattering gravel between his tire and the roadbed, he could prevent the dangerous slipping or skidding of the automobile on slippery days, and this led to the idea of interposing flexible cross chains between the roadbed and the tire, which acted much like a handful of gravel. Then resulted the idea of carrying these chains on the tire, and finally Parsons realized that if he could construct a kind of flexible trough that would be carried on the tire, interposing the cross chains at intervals between the tire and the roadbed and yet would be free to shift its position continuously around the tire, the skidding of the automobile would be prevented and at the same time no such injury would result to the tire as would be the case if metal traction devices were held for any length of time in given places on the tire. Thus resulted the so-called chain grip which is described by Parsons in his patent as a "kind of metal flexible trough."

The tire chain or chain grip as put upon the market by the Weed Chain Tire Grip Company is a chain ladder consisting of two flexible chain side members with a series of chain cross members. One end of each side member is provided with a connecting hook. The whole device is so proportioned that when it is placed over the tire of an automobile and the opposite ends of the side members are connected by the hooks referred to, the side members will be located at opposite sides of the tire and practically at the rim of the wheel. These side members act solely to keep the device on the wheel. They do not come in contact with the ground and are located so far toward the hub of the wheel that the grip as a whole cannot be accidentally pulled over the periphery of the tire. The cross chains pass at close intervals from one side chain across the tire to the opposite side chain. When the automobile thus

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equipped travels along the road, the cross chains are successively presented between the tire and the roadbed, locking the roadbed and the automobile together and effectively preventing slipping or skidding. It is because of this gripping action of the cross members on the roadbed and the tire that the device has come to be known as the chain grip. Because of the shortness and location of the side members, the chain grip may be loose on the tire and free to shift its position circumferentially around the tire when the latter is in motion without being in danger of coming off the tire. The shifting or creeping of the grip is of great importance from the practical standpoint, inasmuch as if the chain grip or any other metallic traction device were held rigidly on the tire and prevented from moving, the metal parts would soon wear their way into the surface of the tire and would also injure the tire internally by causing the separation of the layers of fabric at the points where the tire was continually kneaded or flexed over the hard metallic surfaces. The shifting of the chain grip around the tire completely does away with the injury referred to. Rapid motion of the chain grip on the tire is not necessary, as even a gradual travel of the grip prevents injury to the tire. The creeping of the grip is due primarily to the fact that the grip is of somewhat larger circumference than the tire itself, and when the tire has made one complete revolution the grip has not quite completed its revolution and thus the cross chains do not come in contact with the tire at the same place at any two revolutions, but are constantly creeping backwards on the tire.

The United States Parsons Patent, which is now controlled by the Weed Chain Tire Grip Company, has been subjected to an extraordinary amount of litigation and has been widely upheld by District and Circuit Courts of Appeals as involving an invention of high merit and as entitled to liberal treatment and broad scope. The test case under the Parsons Patent was decided in the Weed Company's favor by Judge Sanborn in the United States Circuit Court at Chicago in the early part of 1910 in a suit against the Excelsior Supply Company. At that time there was widespread infringement of the Parsons Patent, as many as forty or fifty concerns being engaged in the manufacture of Tire Chains that were for the most part direct copies of the Weed device. The decree in the Excelsior suit was affirmed by the Circuit Court of Appeals and an attempt on the defendant's part to review the same in the Supreme Court of the

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United States failed. Then followed various attempts to evade the Parsons Patent by slightly modifying the chain grip structure in various immaterial respects. A number of concerns placed upon the market the so-called tight-fitting or snug-fitting grips that were provided with various forms of tension members and take-up devices for the professed purpose of enabling the grips to be fitted upon the tire more snugly than the regular Weed Chains. The manufacturers of this type of grip contended that the Parsons Patent was to be limited to a device that hung loosely on the tire and did not cover their devices that were tight fitting. In various suits against the snug-fitting grip it was demonstrated that all of these devices crept around the tire with sufficient rapidity to give the benefits made possible by the Parsons structure and Circuit Courts, District and Circuit Courts of Appeals in various cases held these devices to be infringements of the Parsons Patent.

Then followed another attempt at evasion of the Parsons Patent, which consisted in adding to the ordinary chain grip, straps, pieces of chain, springs or other so-called "anchoring" devices for the professed purpose of enabling the purchaser of the grips to pass the "anchor" over the felloe of the wheel and fasten the same so as to prevent any creeping of the grip on the tire. The Weed Company brought suit against a large number of concerns exploiting "anchored" grips and in all cases obtained preliminary or final injunctions. It was demonstrated to the courts that the so-called "anchors" would not be used by the automobilists but would be removed or otherwise treated so as not to interfere with the creeping of the grip, it being universally recognized that a tire chain must be allowed to creep in order to prevent injury to the tire. In various cases in the lower courts and in Courts of Appeals, injunctions against these grips were sustained.

In a recent case under the Parsons Patent the Circuit Court of Appeals, Second Circuit, said:

"If it be possible in a patent cause to reach a stage where everything that has the remotest bearings on the issues has been said and where every question relating to the validity of the patent has been decided, this would seem to be such a case. All the important questions have been decided over and over again by the unanimous judgment of 24 Tribunals, 6 of them being Courts of Appeals. We have been unable to find a single vital proposition advanced at this hearing which has not been decided against the defendants over and over again."

The records of the Federal Courts show that decrees have been

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rendered in favor of the Parsons Patent in upwards of forty contested cases and in a large number of other cases where the defendants having been brought into court, undertook to make no active defense.

FRANK W. CANFIELD

The next most important invention that was sustained by the United States Circuit Court of Appeals was the patent of Frank W. Canfield, covering the universally used chambered spark-plug, issued October 18, 1898, number 612,701. This invention played an important part in the development of the automobile, but accomplished little or nothing in the way of benefit for the patentee.

Canfield was a Michigan lumberman and invented the spark-plug primarily for his own use in a motor-boat engine. He was in poor health toward the close of his life and died less than six months after the patent was issued to him. The claims allowed in the patent covered the generic type of plug which contains a chambered space around the electrodes. The space is left for the purpose of checking the entry and circulation of gasoline vapor about the electrodes to such an extent that when the charges are fired, deposits of carbon will not be made in sufficient quantities to foul the plugs and consequently interfere with the ignition function of the motor.

The air at the bottom of a deep narrow recess bored into a spark-plug would be "trapped," so that there would be no circulation at the bottom, even during the cycle of an automobile motor and by placing the upper part of the electrodes in this "trapped" air, Canfield figured to protect them from carbon deposits.

Canfield's invention was one of those ridiculously simple little things that anybody might have figured out, and when he took out his patent he probably had little idea that his device was destined to become one of the most important parts of millions of automobiles.

The invention was fully disclosed in the patent and as soon as automobiles began to be manufactured in quantities, accessory makers hopped onto Canfield's idea and a dozen or two flourishing companies began to turn out improved forms of chambered spark-plugs. One concern made 50,000 of them between 1901 and 1904 without so much as saying "by your leave." But Canfield was dead and his administrator happened to be a trust company, which in 1899 did not have

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any detailed knowledge of the automobile art or the possible importance of a spark-plug patent.

In 1901 the trust company assigned and transferred the patent to Charles J. Canfield, brother of the deceased inventor, who likewise was a lumberman and knew little about the possibilities of the automobile industry.

There is no record that the trust company or Charles J. Canfield made any very earnest efforts to do anything with the patent. It is quite certain that they knew nothing whatever about the general infringement that took place almost from the day of the first run of automobiles. But in 1903, Canfield assigned the patent to E. D. Wheeler, a mechanical engineer, who might have been expected to appreciate the value of the invention. That Wheeler did is evidenced by the fact that he got into negotiations with William A. Redding, patent counsel for the A. L. A. M., and impressed Redding with the value of the patent to such an extent that Redding recommended that the patent be purchased by the Association Patents Company for the benefit of the A. L. A. M. Through the skill of Redding this purchase was made on favorable terms March 12, 1906, chiefly for the purpose of protecting members of the association from suits or threats of suits by patentees who thought they had fundamental patents in the spark-plug line.

The Association Patents Company and the Association of Licensed Automobile Manufacturers were not in the business of making spark-plugs and never figured in that way in the development of the patented article, and in March, 1909, on the advice of Redding, the Canfield patent was transferred to A. R. Mosler, who then as now made spark-plugs on a large scale. The sum paid for the patent rights by Mosler was small and the agreement made with him provided for licenses to use the plugs to all members of the association.

In September, 1909, Mosler filed suit against a dozen manufacturers, charging infringement and asking equitable relief, and was defeated in the United States District Court. On appeal to the final tribunal he won, and the patent was broadly sustained in the opinion of Judge Lacombe.

The life of the patent terminated by limitation October 18, 1915.

Profiting the inventor nothing; bringing nothing to his estate; the Canfield patent was twice sold for a small sum, $3,500, but made a fortune for Mosler. It also had quite a strong influence on the

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A. L. A. M., for participation in its protection was one of the advantages it held out to members and prospective members.

Altogether, its history is about as romantic a little story as will be found in the chronicles of any other industry than that in which the automobile is the central figure.

ARTHUR W. GRANT

Of all the thousands of patents applied for in the modern tire art, only one was sustained in the highest court, in this instance, the Supreme Court of the United States. Ordinarily a patent suit reaches its end when the United States Circuit Court of Appeals renders its decision and the usual motion for a writ of certiorari to the Supreme Court has been denied. But in the case of the patent issued to Arthur W. Grant, February 18, 1896, covering the idea of embedding longitudinal wires in the substance of a solid tire, the case went clear through to the august Supreme Court.

It happened in this way: Grant's assignees sued various alleged infringers of the patent and in one case the patent would be sustained in the District or Circuit Court, while in another it would be overthrown. On appeal, the matter was still further mixed by the varying opinions of different Circuit Courts of Appeal. When nobody in or out of the tire trade knew his status concerning the Grant patent, the Supreme Court took cognizance of the situation and allowed the writ of certiorari, carrying the case up.

The opinion of the court was favorable to the patent, which stands alone in the whole field of automobile litigation, in the fact that the Supreme Court ruled upon it. It also stands alone in the tire field as the only patent that was fully adjudicated and sustained.

The principle of the Grant patent was valuable. It covered the wire feature, where the wires, two or more as a rule, were embedded in the base of the tire to give it substance. The tire was seated in channeled rims, the sides of which diverged slightly, thus allowing of a greater degree of wear on the rubber than would have been possible if the tires were held within the rims by compression.

The Grant patent was the chief patent under which the Kelly-Springfield solid tires were made. In a money way the patent probably earned a considerable sum and the patentee profited moderately

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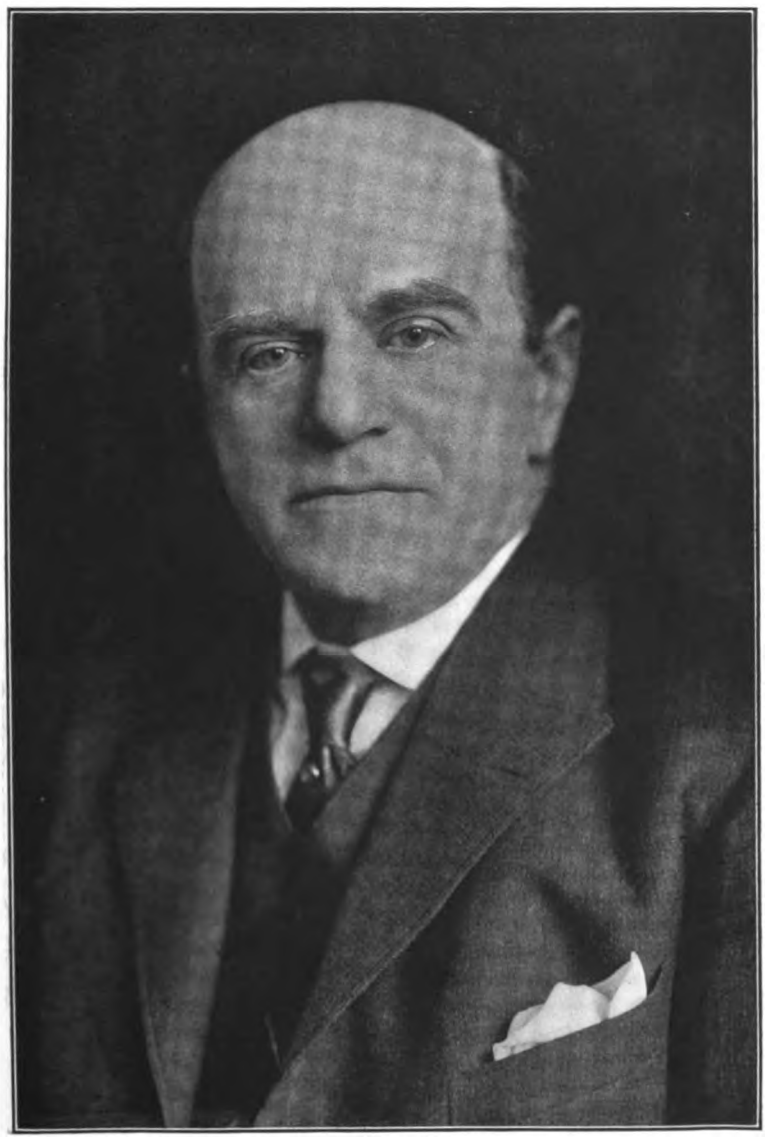

LOUIS HENRY PERLMAN
Inventor of the Demountable Rim.

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through his inventiveness. But it expired by limitation early in 1913 at a period of automobile truck-making, when a tire patent controlling only a section of the whole output of truck tires probably failed to meet the expectations of its owners.

Grant's contribution was considerably greater to the art of motoring than it was to himself in a material way, because he was too early to reap the greatest benefits. If he had been able to keep his application pending until, say, 1903 or 1904, and then had the patent issue, as he probably could have done if he and Edwards S. Kelly had foreseen the great demand that was sure to come for truck tires, he would have made a fortune. Instead, however, the patent was issued without delay and expired just as the business built around it was becoming of enough volume to bring rich rewards to the inventor. The automobile industry now has the benefit of it, to use in any way it sees fit, and it may be noted that the use of Grant's idea is growing.

LOUIS HENRY PERLMAN

Multi-millions overnight crowned the ten-year battle of L. H. Perlman for his demountable rim patent rights, and in the dazzling brilliance of that achievement the world generally, and the automobile industry in particular, have been disposed to overlook the struggle through which the result itself was accomplished.

Perlman, according to the decree of the highest court, is entitled to the honors and emoluments of inventing the demountable rim, but the records show no fiercer campaign and no more hopeless outlook than were Perlman's from the date of his patent application in 1906 until the ruling in his favor of the United States District Court in August, 1915. Since then, the formal court orders have been uniformly in his favor, and now, with his patent adjudicated by the United States Circuit Court of Appeals, the court of final jurisdiction, he occupies an entirely unique position in the automobile industry.

THE INVENTION

Mr. Perlman's invention of the demountable rim was at once the Alpha and Omega, the Genesis of the whole present-day demountable rim construction; the invention as developed and completed by him in 1903 and 1904, covered the whole rim field like a blanket, and so

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effective, thorough and complete was his original work, that to-day every demountable rim in use infringes his patent.

Perlman's invention of the demountable rim was of an unusual and wonderful character, because when he undertook to master the demountable rim problem, he solved it for once and for all time.

Let us consider for a moment the salient features of Perlman's invention.

First: He was the first man to conceive the idea of constructing a demountable tire-carrying rim which when applied, fitted loosely on a wheel, and the rim was easily removed as applied. In other words, Perlman was first to utilize an element which locked a loosely fitting rim to a wheel-body, pushing the rim away from the wheel, enabling the rim to be held firmly and tightly in place while in use, but, by the release of the locking element, the rim became again loose, so that it could be manually removed, or fall off itself.

Second: The Perlman locking element was a wedge! Perlman's idea provided a place for a wedge where no wedge had ever been provided before. Previous to the Perlman invention all rim-locking devices, when unlocked, left the rim still tightly seated on the wheel, just as tight as it had been before it was unlocked, and the rim had to be removed from the wheel by force to overcome that tight fit.

Perlman made the discovery that the correct method of mounting a demountable rim was not by having it bound tightly down against the periphery of the wheel, but by pushing it away from the wheel, under conditions and with devices capable of holding the demountable rim tightly and firmly mounted, spaced from the wheel during use, and adapted, when the rim was to be released, to having that tight mounting rendered loose before any attempt was to be made to remove the demountable rim. Since the claims of the Perlman patent are directed to certain details of the locking means by which this result was accomplished, it is desirable to note that the locking means invented by Mr. Perlman consists essentially of a wedge, not employed to act as wedges ordinarily do act, but given a place where no place had ever before been provided for a wedge, and anchored to the wheel-body by a propelling means as no wedge ever before had been anchored. The specific and detailed structure of this feature, as found in the Perlman patent, was the wedge at the end of a bolt, and its anchoring and propelling means consists of the bolt itself.

Prior to Perlman's invention a few patents were issued for

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demountable rims held tight upon their wheel-bodies by conical and taper fit, or bolts pulling the rim down against the wheel-body. Perlman's idea was just the reverse, he, while holding the rim rigidly in place on the wheel, separated them by wedges.

Third: Perlman was also the first to suggest ways and means for clamping the beads of a tire into the clincher flanges of the demountable rim. The Perlman idea of the short stem lug, with its threaded detachable handle, now known as an extension tool, while familiar to us all to-day, was new in 1903. He invented it, and his device was the only practical solution for operating a short-stem lug, and manipulating it manually when applying the tire to the demountable rim.

Fourth: Perlman was also the first to invent what is to-day known as the Q. D., or quick detachable demountable rim, which permitted the use of the hard-beaded edge tire on the rim. This style of tire has since been evolutionized into what is now familiarly known as the Straight Side tire, and the hard-bead clincher tire, both usually termed Q. D. tires.

Fifth: Finally, it is worthy of note that Perlman covered in his invention all the essential features required in demountable rim construction exactly as they are in general use to-day, and nothing material has been added since, although nearly one thousand patents have been issued by the United States Patent Office on detailed and varied features of demountable rims during the past eight years. Notwithstanding the issue of these thousand patents, under the court's decision, the Perlman patent still remains the basic, elementary and foundation patent of demountable rim construction.

STORY OF THE INVENTION

It was back in 1900 that Perlman first rode in an automobile at the invitation of a friend, John H. Duffy, a prominent paper merchant, of New York, who owned a Mobile steam car. Later Mr. Duffy bought a larger car of French make, the Richard, so big that tire troubles were discouragingly frequent. Mr. Perlman was frequently called on to lend assistance in changing, repairing and pumping up tires, so that he became familiar not only with the character of the punctures and blowouts, but also with the amount of work required in remedying them.

Early in 1902 Mr. Duffy purchased a still more powerful car, an American-built car called the Walter, which weighed about five thou-

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sand pounds. Naturally, Mr. Duffy's tire troubles immediately became a more consistent factor in causing annoyance and delay, the trips on which Mr. Perlman accompanied him at that time almost invariably being punctuated by several tire changes. In working over these repairs, Mr. Perlman's mind turned to the thought of reducing the time and labor required in applying the tire to the wheel.

He studied the tools then in use and devised modifications which reduced the time necessary for the operation, but found that such tools would make a difference of only a few minutes in applying the tire.

Perlman's conception of the demountable rim was really a road inspiration—truly a romantic joy-ride! Early in 1903 Mr. Duffy invited Perlman to accompany him on a trip to Cornwall, New York, where his two sons and Mr. Perlman's son were attending a military academy.

They had, of course, the usual punctures which were common in those days, and after they had made a roadside repair of the inner tube, Perlman started to pump up the tire, using the primitive hand pump of the period. While engaged in this work and perspiring under the task, he suddenly realized for the first time that all his previous ideas were wrong; what was wanted was a removable rim idea, so that the tire could be put on the rim in the garage or barn, inflated there, and carried on the car as a separate unit, just as we do nowadays, and then his only problem was to conceive mechanical ways and means for carrying out the idea practically. This he accomplished after exhaustive, costly, laborious experimental work, finally adopting the wedge and screw, and the air space between the two rims which prevented the rims from rusting together.

In August, 1904, Perlman applied his completed wheels embodying his invention of the demountable rim, finished by him in 1903, on a Royal car, and later, in October, 1904, he put his wheels on a Welch car, and then Perlman realized that his methods of mounting the demountable rim and the short stem lug used for securing the tire on the rim, were perfect and complete. Later on in the same month he drove this Welch car to the first Vanderbilt cup race on Long Island.

IN THE PATENT OFFICE

Mr. Perlman delayed filing a patent application until he could devise a means to facilitate the work of changing tires in the garage after the demountable rim had been brought in with a puncture or

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blow-out. In 1905 he constructed a split rim, or demountable Q. D. rim. He then took the first steps toward obtaining a patent, filing his first application May 21, 1906, and on June 29 of the same year a continuation and substitute for it with some additional details. The idea he wished to patent was, as he then well said:

"A wheel whose demountable rim is bodily detachable from its fixed rim and felloe, means being provided for firmly and rigidly retaining the demountable rim on the fixed rim and felloe while in use, such means at the same time being adapted to be manipulated for enabling ready, rapid and easy removal of the demountable rim when required."

The feature of this idea was the use of a demountable rim secured to the wheel rim or felloe by a wedge and screw so that the air space provided between the two rims prevented them from rusting together. It was the combination of these factors which made his basic patent possible.

In the Patent Office Mr. Perlman's application passed from official to official through Boards of Review, was heard and reheard by each one several times, the years rolling by as the Patent Department red tape slowly unwound, kinking and knotting here and there as fresh points of dispute arose. Two Commissioners of Patents passed upon his claims, and during their administrations his patent was before every departmental tribunal several times, and was once reviewed by the United States Court of Appeals of the District of Columbia. At last his essential claims were allowed, and in the final analysis the very trouble he had in securing his patent redounded to his advantage when he brought his infringement suit against the Standard Welding Company, of Cleveland, Ohio, and the Packard Motor Car Company.

One of the reasons for Mr. Perlman's difficulty in securing recognition of his claims in the Patent Office was the very simplicity of his invention, the patent officials questioning whether the simple act of combining the wedge and screw principle in the mounting of a demountable rim with an air space between the wheel and tire rims constituted an invention.

The inventor, in sharp distinction from the practice of Selden, tried to force the issuance of his patent as quickly as possible. He had no reason for dilatory tactics, but he encountered various kinds of opposition, in and out of the Patent Office, that delayed the date of

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issue until February, 1918, being No. 1,052,270. Of course, the industry is greater than it was in 1906, but the delay cannot be laid at Perlman's door. Because of the delay, the rights granted him run until 1930.

A BRIEF BIOGRAPHY

Louis H. Perlman was born in Kovno, Russia, November 26, 1861. His father, Lesser Perlman, was the descendant of a long line of rabboni, and was himself a rabbi and a very learned man, widely recognized as an expounder of the Talmud and noted for his range of studies and general learning. Leaving his wife and three children in Russia, Lesser Perlman came to the United States in 1862 and had charges at Cincinnati, St. Louis, Charleston, S. C., and other places during the most violent period of the Civil War.

In 1864 Rabbi Perlman sent for his family, paying $500 in gold for their passage on a sailing packet. The voyage was long and stormy, but at the end of three months the family were happily reunited in New York.

Perlman's mother was a model woman, highly educated and possessed of unusual personality, charm and accomplishments. The inventor was her only son, and she gave him real encouragement and inspiration in his battle to secure an education without draining the family resources too severely. It was his mother's wish that the inventor should be a lawyer, while his father intended him to be a doctor. Fate, Providence, or what you please to term it, decided that he should be neither, but, what was more important, a mechanical genius.

On arriving in America the Perlman family went to Utica, N. Y., where Rabbi Perlman then had a congregation. They lived in Utica until 1867, when the father took charge of a congregation in Providence, R. I. Louis attended public school there until 1872, when New York City became their permanent home.

Graduating from the famous Christie Street New York grammar school No. 7 at the age of fifteen, Louis entered the College of the City of New York, which he attended for four years, taking first the commercial course, which comprised stenography, bookkeeping and similar business subjects, and later taking up the academic course.

Largely on account of his stenographic ability, he drifted into the newspaper field, being connected for some time with J. J. Little & Co., printers and bookbinders, at that time located on Astor Place, this firm later becoming the J. J. Little & Ives Co., of East Twenty-

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fourth Street. Mr. Perlman's second business was with R. W. Shoppell, with whom he built up an organization known as the Pictorial Associated Press, which was organized for the purpose of selling illustrated news service to daily newspapers in the leading cities throughout the United States. This concern did a large business with all the leading dailies of the country. It was a pioneer in the business of educating newspapers to the use of illustrations. In this work Mr. Perlman was frequently thrown into contact with such prominent men in the newspaper field as Pulitzer, Watterson, Halstead, etc., and had the distinction of selling to Charles A. Dana the first picture ever printed in the New York *Sun*. This was a picture of Congressman Holman, from Indiana, for whom Mr. Dana had launched a boom as candidate for President of the United States. Unfortunately for Mr. Holman's aspirations to the post of Chief Executive of the Nation, this illustration, owing to the lack of facilities for printing illustrations on newspaper stock, appeared as a hopeless blur, so that the humorous and editorial writers of the opposition dailies made short work of his prospects.

Mr. Perlman continued to be identified with publishing work for many years. In 1881 Louis Klopsch, who at a later date became publisher of the *Christian Herald,* acquired Mr. Shoppell's interest in the Pictorial Associated Press, and Messrs. Perlman and Klopsch formed an association with the Rev. Dr. T. DeWitt Talmage, whose sermons were later syndicated throughout the United States by the Pictorial Associated Press, of which Mr. Perlman, then twenty years of age, was the active head. Irving Bachellor, who later won fame in the literary world, was associated in this pioneer syndicating work, as an editorial writer.

Mr. Perlman was connected with various publishing activities until 1905, when he became the New York City agent for the Welch car, which was manufactured by the Welch Motor Car Co.

HIS SUCCESSFUL LITIGATION

His patent recognized by the Patent Office, Mr. Perlman set about securing its recognition by the automobile industry. On October 7, 1913, he filed suit in the United States District Court for the Southern District of New York against the Standard Welding Company, of Cleveland, Ohio, the leading manufacturer of demountable rims, and whose construction, Mr. Perlman alleged, infringed his patent. This litigation proceeded actively for nearly two years, Judge Hunt at

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length handing down a decision in Mr. Perlman's favor on August 18, 1915, holding the Perlman patent valid and infringed by the Standard Welding rims. An injunction was issued by the court in favor of Perlman in September, 1915, which prohibited the Standard Welding Company from further infringement of his patent, and appointing a special master to determine damages. One of the interesting facts about the case was Judge Hunt's statement that Perlman had freely disclosed his invention to the defendant prior to the beginning of manufacture by the defendant.

An order was also issued at that time allowing the Standard Welding Company to appeal to the Circuit Court of Appeals, which was subsequently done, Judges Lacombe, Coxe and Rogers, on February 15, 1916, handing down a decision upholding Judge Hunt in declaring the patent valid and infringed. A permanent injunction was issued on March 8, 1916, stopping all manufacture and sale of demountable rims by the Standard Welding Company.

THE PERLMAN RIM CORPORATION

The next step was the formation of the Perlman Rim Corporation of New York with a capital of $10,000,000, Mr. Perlman being president. The announcement of the formation of the new company was made March 15, 1916, on which date the company was incorporated. W. C. Durant, president of the General Motors Company and the Chevrolet Motor Company, and Louis G. Kaufman, president of the Chatham and Phenix National Bank, of New York City, were interested in the formation of the concern. These gentlemen financed and assured the sale of a portion of the stock of the corporation bringing $3,000,000 to its treasury in a little over a month.

Immediately after the formation of the corporation two plants were acquired for the manufacture of demountable rims under the Perlman patent, one of these being the Jackson Rim Company factory in Jackson, Mich., which became the Perlman Rim Corporation, Jackson Plant, additional factory buildings being started immediately, so that within three months the plant would be capable of producing 4,000 sets of demountable rims per day, or at the rate of over one million sets a year. The other factory secured at this time was the rim plant of the Mott Wheel Works, of Utica, N. Y.

Offices were opened in the U. S. Rubber Building in New York City and orders were received at once from a large number of the leading automobile manufacturers in the country, the Perlman Cor-

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CLYDE J. COLEMAN

Inventor of the Electric Starter, Brake Lining and many other automobile devices.

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poration assuring the car manufacturers that its facilities would enable it to take care of the entire demand for demountable rims.

The story of Perlman's ten-year fight is romantic, and may well be termed "Romance of the Rim." In 1906, when Perlman filed his application for the patent, he was a man of means and well able to finance the patent, but he was forced to personal economies of a rigid sort at the final stages of the campaign. Indeed, if final decision had been withheld for a few months more it is certain that the inventor, who, by the way, is a good business man, would have been obliged to center his attention on money-making in order to provide for his folks.

But, as it turned out, he did not have to break into his last $100.

Perlman's legal battle for the recognition of his patent rights ranks in importance with the famous Selden litigation, stands forth as one of the most important and most interesting of the men prominent in the story of the automobile industry, because he finally won out, while Selden finally lost out.

CLYDE JAY COLEMAN

During the first ten years of the automobile industry as a major factor, say from 1903 to 1913, the necessity of cranking the motor by hand checked and hampered the use of the automobile. The physical labor was too much for nearly any woman and the dangerous "kick" of the refractory motor resulted in thousands of broken arms or injured bodies even when strong men attempted to start their cars.

The prospect of "cranking up" the car in rainy weather often prevented its use and consequently kept down its normal mileage, for many a motorist preferred to do without the service of his car at certain times rather than run the risk of spoiling his clothes and shoes. Obviously, the whole field was barred to feminine motorists under practically all conditions that presume the actual operation of the car by woman.

The invention of the electric starter opened up a new field for automobile sales beside increasing the potential service of all cars outside that field. Deservedly the invention of the starter should be rated among the most important improvements that have been made in the automobile.

It has been estimated that the use of the starter has added one-

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seventh to the service of the motor car, beside extending its field to at least 1,000,000 potential purchasers that could not be reached for sales except through its inclusion in the equipment of the automobile!

Although the name of Clyde Jay Coleman has become familiar to the general public and to the automobile industry in particular, in connection with the famous starting and lighting patents, the importance and wide scope of Mr. Coleman's inventive achievements in the automobile and other fields are not so universally realized.

Mr. Coleman was born March 7, 1871, in Calcutta, Douglas County, Kansas, a rural community about ten miles southwest of the town of Lawrence. His father was one of the pioneers drawn by the lure of the great West, and was one of the "Forty-niners" famed in song and story of those romantic days. Eventually he followed the example of his early American ancestors, some of whom were soldiers in the Revolutionary War, in seeking new territory for his home, settling in Eastern Kansas with his wife, who also was of American descent, tracing her ancestry to Germany and Holland. Both possessed a large measure of originality and constructive ability, and when Clyde was born he inherited these attributes in a marked degree.

The grain and stock farm on which Mr. Coleman spent his boyhood days owed much of its development to his father's inventive ability. The farmhouse was picturesquely situated at the edge of the woods at the top of a hill overlooking the hills and valleys in every direction. One of the features of the farm was its large dairy establishment; the grain elevator and grist mill testified to the progressive method of the elder Coleman, who designed and constructed a novel and very powerful windmill to operate the Burr stones. All agricultural machinery used about the farm was kept in excellent mechanical condition and every effort was made to keep the equipment up to date.

Clyde and his brother Clarence, like every other boy living the healthful, outdoor life of the farm, were fond of trapping rabbits and other small game, but, unlike most boys, used to invent and construct special devices for this purpose. When Clyde was eleven years old he created a great deal of interest by devising a new method of milking cows by inserting tubes made from large chicken quills and letting the milk stream into the pails by gravity. A year later, having been told that the earth rotated at the rate of one thousand miles per hour,

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he considered the possibility of utilizing this as a means of travel by ascending to the upper air in a balloon and remaining suspended in space until the earth had rotated sufficiently to bring the desired point immediately beneath, when the descent would be made. Most of his creative ideas, however, were of a more practical nature. Clyde always had a passion for machinery, and would follow the harvesters and threshing machines with all the interest which most boys reserve for circus parades and similar attractions. Almost invariably he caused his father considerable worriment by getting lost in the flouring mills or the water-power plant at Lawrence when they brought a load of wheat to market.

At the age of fourteen Clyde graduated from the Washington district school and during the following year took a six months' course at the Lawrence Business College. When he was sixteen he took out his first patent, which proved to be of sufficient value for the United Shoe Machinery Company to send a representative to purchase it at a good price. A year later, while at work on the development of some of his inventions at Kimball's Foundry and Machine Works in Lawrence, he won a handsome reward by solving an intricate problem in connection with the construction of a new automatic barbed wire machine which was being built for a wealthy barbed-wire manufacturer of that town.

In 1889 Mr. Coleman went to Chicago, where he took up the development of shoe machinery, working in connection with certain members of Phelps, Dodge & Palmer and the Ross-Moyer Manufacturing Company. During the following year he was engaged in construction and special development work. It was at this time that he invented and patented a new dry battery which was the first to employ blotting paper liners, now universally used on all dry batteries. For two years Mr. Coleman manufactured these batteries on an extensive scale, selling them to the Knapp Electrical Works, the Central Electric Company and a number of other concerns. The patent covering their construction was later purchased by the National Carbon Company. In addition to manufacturing batteries and small motors during 1891 and 1892, Mr. Coleman was actively interested in numerous other pursuits, doing special work for the Chicago Screw Company, the Thompson-Houston Company and the Chicago Arc Light and Power Company during the former year. In 1892 he built a two-seated electric surrey with side entrance, canopy top and wire

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wheels at the Chicago Bicycle Works, and successfully operated it around the streets and parks of Chicago. This vehicle, besides drawing wide public interest, attracted the attention of the electrical engineering fraternity, with the result that Fred Dagenhardt, one of the most prominent of the engineers, entered into negotiations with Mr. Coleman for the construction of a number of electrically-driven chair units to be operated with the same type of motor and battery and to be utilized for transporting visitors at the World's Fair grounds held in Chicago the year following. This project was abandoned because of the financial difficulties which beset the Bicycle Works just as the tentative plans were beginning to assume practical form.

Mr. Coleman did not lose interest in the possibilities of the electrical vehicle, however, and during the year 1893 he widened the scope of his activities in the automobile industry by taking up the design and construction of special electric motors for automobile use. He also entered into negotiations for the manufacture of electric vehicles on a commercial scale with the Staver & Abbott Carriage Company, the Studebaker company and a number of others. His lack of success in convincing any of these manufacturers of the practical possibilities of his vehicle Mr. Coleman attributes to the fact that at that time no one seemed to have any confidence in the future of the automobile, in spite of the gratifying demonstrations afforded by his new types of motors, batteries and running gear improvements.

Deciding that the time was not yet ripe for developing his inventions in the behalf of the self-propelled vehicle, Mr. Coleman directed the efforts of his versatile genius into fields which at that time were less visionary, being engaged in 1894 in designing and making some special electrical and therapeutic apparatus for Charles Truax Green and Company, Dr. Senn, the celebrated surgeon of Civil War fame, Dr. Thomas, the Rush Medical College and others. At the same time his busy brain was creating, developing and perfecting an extensive line of electric heating, cooking and other household devices, which he carried to completion in 1895.

Mr. Coleman, true inventor that he is, has always been fascinated by the unlimited possibilities of electricity, and in 1896 invaded another field to which it might be usefully and profitably applied, his endeavors meeting with the success which seems to characterize the inventions covered by his patents when they are constructed and marketed in accordance with his ideas and as he originally intended. This

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time it was an invulnerable system of electric protection for banks and vaults, which he brought out in 1896, later organizing the Bankers' Electric Protective Company in connection with members of the Hall Safe Company to take over the patents covering its construction and to carry out the manufacturing and marketing of the new product. These patents, after considerable litigation, were sustained by the courts and the manufacture of the electric protective systems was continued by the Bankers' Electric Protective Company and the American Electric Bank Protection Company. Inside ten years over five thousand two hundred of the systems were in use by banks throughout the country.

In addition to continuing the manufacture of the bank protection systems in 1897, Mr. Coleman took up in an extensive way the development of an electric furnace and metallurgical work. He was also called to Washington during this year by Lyman J. Gage, Secretary of the Treasury, for the purpose of making a complete investigation and report on the vulnerability of the United States Treasury Building and its requirements for the installation of electric protection. The following year Mr. Coleman operated a development laboratory and designed several special devices for various manufacturing concerns. At this time he also developed a new process and the requisite apparatus for the manufacture of carbonic acid gas.

The year 1899 was one of the busiest of Mr. Coleman's career up to that time, for, besides continuing the operation of the development laboratory, he brought out a number of inventions, one of the more important of these being a new electric semaphore signal system for railroads which was developed for the Hall Signal Company and which was put into extensive use by the Illinois Central Railroad. In the Fall Mr. Coleman was engaged by members of the Electric Vehicle Company to go to New York City to take charge of the development of electric vehicles and to do consulting work on car axle lighting systems for railroads. Most important of all, this was the year in which the method for automobile electric starting and lighting systems, which has since brought Mr. Coleman wider renown than any of his other inventions, was conceived and put in concrete form by sketches and descriptive memoranda.

As far back as 1896 Mr. Coleman had been interested in the study of gasoline engines for automobiles and examined carefully the construction of gasoline cars whenever he had an opportunity. He

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realized the crudity of the gasoline automobile engine of that day, one of the features that presented special difficulty being the starting problem. This Mr. Coleman resolved to solve, and he endeavored to devise various means of accomplishing it in a simple way. Because of his familiarity with the flexibility of electrical apparatus and the engineering possibilities which it would afford him, he settled upon this as one of his first means of solution and embodied some of these ideas in a sketch which, while not very complete, was sufficient for his own guidance. This sketch, which was made in the Spring of 1899, over a decade later figured prominently in the litigation which led up to the recognition of Mr. Coleman's rights as the inventor of this important contribution to the art of the automobile engineer.

Upon his arrival in New York Mr. Coleman submitted the starting and lighting idea to Thomas J. Ryan, who was one of the men instrumental in bringing him from Chicago, but failed to interest him, Mr. Ryan being a devotee of the electric vehicle and not a believer in the gasoline automobile. At this time Mr. Coleman made a more complete sketch outlining his starting and lighting system. In this drawing a Stanhope type of car containing a gasoline engine in connection with an electric unit which could be used for starting the engine and then, without changing its direction of rotation, could be utilized as a generator of current which would be available for lighting, etc., through the medium of a storage battery. On the same sheet Mr. Coleman wrote the following memorandum: "Take out two patents, one showing dynamo and motor separately, so motor will have different gearing leverage or torque connection with gas engine of automobile from dynamo, which must run slow." The purpose of this notation was to keep in the inventor's mind the two ways of establishing a torque relation between the electrical unit and the gas engine. In other words, Mr. Coleman intended that when the electrical unit was used as a starter it would be operated either far above its normal rated capacity through a variation of field intensity or else a greater torque relation would be obtained by using the unit at substantially its rated capacity and employing a mechanical difference of leverage or gear relation, or other mechanical connecting devices between it and the gas engine, whereas when the electrical unit was operated as a dynamo it revolved at a normal rate. Another memorandum on the sketch marks the conception of an important feature of the system: "Could use electric clutches to connect one or the other as required.

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Other case to have both effects combined in one apparatus." This referred to the use of an overrunning type of clutch, so that when the electrical unit was starting the gas engine it would be running at high speed and transmitting the starting effort through a set of planetary reduction gears, but as soon as the gas engine took up the work and ran ahead of the electrical unit the clutch in this set of gears would lock and the second clutch take hold, operating the unit as a dynamo at much slower speed, the first clutch and gearing being idle.

In 1900, the year after the invention of the starting and lighting system, Mr. Coleman spent a large part of his time in carrying on a suit against Mr. Ryan for constructing and sending to the Patent Office an alleged false assignment on a number of Mr. Coleman's inventions. He also was very busily at work developing automatic household refrigerator systems, besides continuing his efforts to interest capital in his electric starting and lighting system for automobiles. During the following year he filed his applications for patents covering this system and took up the design and construction of gasoline automobiles. He then built several starting systems which were the first to be made in accordance with his patent applications. Besides these activities, Mr. Coleman found time to develop the "Electro Gas" signalling system for the Hall Switch and Signal Company. He also corresponded with Henry Ford and others, advocating the formation of a defensive association to oppose the Selden patent.

The gasoline car in which Mr. Coleman was interested at that time was built by the Rockaway Automobile Co., of Rockaway, N. J., of which he was one of the organizers. The first car turned out of the company's shops was a Brewster runabout converted into an automobile by attaching steering knuckles to the front axle and wheels, the swivel of the axle, or what is commonly known as the fifth wheel, being riveted to make it rigid, the lever type steering connections in use at that time being put on, attaching sprockets to the wooden hubs of the rear wheels and mounting the power unit on a frame. For this car Mr. Coleman developed a rotating engine similar to the Gnome, which is so widely used in the aeroplane work. The engine had five cylinders and later the company tested out a single-cylinder engine with four and one-half inch bore and four and one-half inch stroke in connection with the electric starter. The latter consisted of a one-eighth horsepower Crocker-Wheeler motor similar to those used at

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that time on the electric semaphores made by the Hall Signal Company, the winding of the machine being changed by Mr. Coleman so as to operate the series and shunt fields together as a compound winding, or as a compound field winding.

Another invention in which Mr. Coleman was interested at this time was an automatic speed shifting device which enabled the engine to run at a substantially constant speed while the speed-gear would automatically shift to meet the varying conditions of the road in relation to the load of the car.

By 1902 the Rockaway company was manufacturing gasoline automobiles with the engine under the hood, using wire or artillery wood wheels, wheel steering, having low center of gravity and embodying modern ideas of construction in all respects. Several starters were built and applied to these cars, and Mr. Coleman endeavored to obtain orders for fitting the starters as standard equipment on various other makes of automobiles, but found that it was impossible to get the manufacturers to spend any money at that time for refinements or extra equipment.

Besides continuing the manufacture of cars and electric starters, which were exhibited at the New York and Chicago automobile shows in 1903, Mr. Coleman developed a brake lining for automobiles consisting of asbestos fibre interwoven with wire in addition to the conventional lining, and after litigation extending over several years he was successful in securing a broad patent covering this feature. Strange as it may seem, Mr. Coleman regards the invention of this brake lining as more important than the starting system.

The Rockaway Automobile Company continued the manufacture of cars until 1905, when it went out of business owing to lack of capital, although at that time it had on hand orders for fifty starter outfits and one hundred runabouts. In 1904 Mr. Coleman devised a new type of storage battery and was also interested in improvements in railroad signalling systems and other inventions.

In 1905 he devised, working in connection with Conrad Hubert, president of the American Ever Ready Company, a new scheme for safely storing acetylene gas under pressure in tanks by means of cocoanut shell charcoal contained therein. It was to Mr. Hubert that Mr. Coleman disposed of his patent rights on the starting and lighting system, the first of these patents, No. 745,157, being granted November 24, 1903, and the other, No. 842,827, on January 29, 1907.

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The first of these patents covers the use of a motor-generator for starting an automobile engine and for the generation of current to charge the storage battery. This patent also describes the means for the control of the vehicle's speed ratio, consisting of a train of gears connecting the motor-generator to the crankshaft through a differential made up of two sets of gearing which can be used alternately by means of a friction clutch, so that the motor-generator drives at one speed ratio and is driven at another. Patent No. 842,827 deals with the means for automatically changing the motor-generator functions from those of a motor to those of a generator according to crankshaft speed, and also for giving a maximum torque by electrical means for starting. Provision is made for controlling the speed of the engine so that it will drive the motor-generator as a dynamo at a constant speed.

During 1906 Mr. Coleman was busy with a number of inventions for the American Ever Ready Works, all of which were related to the automobile industry. He also devised a continuous rail signalling system for electric railway use for the Hall Signal Company. In 1907 he turned his attention to evolving a new process for the complete and fractional distillation of wood and coal products, and in 1908 developed a moth-proof wardrobe system for household use. His most important activity during the following year was the development of a refractory furnace for economically producing calcium carbide and for special metallurgical operations.

Another field called to him in 1910, and the result was a new core drill apparatus capable of boring to depths limited only to a point corresponding to a temperature of 490 degrees Fahrenheit, this system being especially suited to geological research work. In 1911 he perfected his automatic diamond polishing machine and an adhesive cement for holding diamonds to a precise alignment on an arbor. After producing a new power system for aeroplanes in 1912, he invented a new form of gas producer in 1913, which he considers the practical solution of the automobile fuel problem, utilizing an inexpensive solid fuel made from specially prepared coal or coke or converting kerosense or crude oil into a permanent gas of high thermal efficiency and operating equally well with gasoline.

In the meantime the Dayton Engineering Laboratories Company, licensed under the Coleman patents in 1911 to manufacture and sell starting and lighting systems in conjunction with Mr. Hubert,

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brought suit for patent infringement in July, 1913, against the Sidney B. Bowman Automobile Company, for selling a car fitted with a North East electric system, this suit being decided in favor of the plaintiffs by Judge Sanborn of the United States District Court for the Southern District of New York in an opinion filed February 27, 1915. Although not financially interested in the patent at this time, Mr. Coleman was the central figure in the trial, which took up a good deal of his time. This suit was appealed to the United States Circuit Court of Appeals for the Second Circuit, which handed down a decision on December 14, 1915, upholding the lower court in declaring the Coleman patents valid and infringed by the North East device as fitted on a car cited in the case.

In spite of the large amount of time which he was obliged to devote to the electric starter litigation, Mr. Coleman in 1914 invented some novel types of color motion picture cameras and projectors, talking-motion picture apparatus and a new high-speed, one-man submarine. The following year he completed a method for the synthetic production of nitric acid and nitrates from the atmosphere which was later adapted for commercial development. In 1916 Mr. Coleman invented his "Castweld" process for quickly and economically building seamless steel ships.

As may be imagined from the wide scope of his activities, Mr. Coleman has made profound studies of electricity, chemistry, physics, geology, biology, microscopy, etc., acquiring his technical knowledge from textbooks and his extensive laboratory experience. While in Chicago he spent a great deal of time in the reading and reference rooms of the Chicago Public Library, the John Crear Library, the Chicago University, Armour Institute and Newbury libraries, in addition to conducting a wide course of reading in books from the circulating department of these institutions. Upon moving to New York he made similar use of the various libraries, as well as doing a great deal of reading in his private library, which he selected with great care and which he has made quite complete.

For over twenty-five years Mr. Coleman has operated a private laboratory in addition to the activities mentioned, developing numerous inventions for various concerns as well as for himself. He has over one hundred and sixty-five issued patents, including some fifteen patents on automobile starters of electric, spring, air, carbonic acid gas, hydraulic, injected gas, etc., types. He also has over fifty appli-

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cations relating to various inventions pending in the Patent Office and data and drawings for over three hundred inventions on which no applications have as yet been made. At the time of going to press Mr. Coleman is engaged in one of the largest undertakings of his eventful career, consisting in making arrangements for the organization of a $10,000,000 Coleman Laboratories Corporation on a sufficiently comprehensive basis to handle all of his interests.

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CHAPTER III

THE ROMANCE OF RUBBER

THE difference between the most efficient automobile built by Walter Hancock in England in the early 30's and the modern car, was not so much mechanical as it was in tire equipment. Hancock's best car was destructive of roads at even moderate speeds and was subject to the destructive effects of vibration to a much greater extent than the modern car, due to the fact that the British pioneer ran his automobile on metal tires that transmitted the ordinary shocks of road travel to the delicate mechanism of his steam engine, without cushioning or absorbing them to any extent. Hancock's car also destroyed the roads about the same as a harrow might.

Elbert Hubbard said in one of his inimitable articles, noted however for its literary grace rather than for its sound foundation, that if the world had possessed the pneumatic tire at the beginning of the Nineteenth Century, the railroads never would have been built.

Hubbard may have been right in his statement in that respect, because the road locomotive had a big start over the railroad and might have been developed to the exclusion of the railroad if the world had had tires to protect the roads and the mechanism of the cars, but a doubt was cast immediately on the whole statement because of Hubbard's superficial reasoning, or lack of fundamental data concerning the tire. In fact he credited the invention of the tire used today on nearly all automobiles to a modern manufacturer, whereas the fact is, the whole principle of the pneumatic tire was discovered, patented, published and used shortly after Charles Goodyear evolved the method of vulcanizing rubber. That was in 1844 and the tire was patented by Robert William Thomson in England in 1845; in France in 1846 and in the United States in 1847.

The art as disclosed by Thomson showed a shoe and inner tube theoretically resembling modern practice and the fact that his idea was so thoroughly patented has been the real obstacle encountered by inventors in this day of the gasoline automobile, that has prevented any

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of the numerous actions that have been brought to sustain the double-tube, pneumatic-tire principle, from a successful issue.

Thomson's patents have stood like spectres in the path of inventors. While they were never used on a commercial scale by manufacturers in any country during the life of their rights under the law, a few sets were manufactured and were used experimentally. One set was made for the brougham of an English gentleman, 5-inches in width and faced with leather and for at least 1200 miles of travel they gave satisfactory service.

Between Thomson and Dunlop there was small progress in the tire art and no suit in modern times has been sustained covering the idea of a double tube tire. The vast mass of litigation that is popularly supposed to apply to the pneumatic tire was actually brought and fought on some point or points connected with the means of fastening the tire to the wheel or in some detail of manufacture, such as have been noted in the field of the non-skid tread.

Richard W. Thomson was the pioneer and he and his musty old British, French and American patents have had a very salutary effect on the volume of tire litigation, compared with what it would have been if they had not anticipated the art.

His tire, however, was a clumsy thing, hard to apply and still harder to replace. It was difficult to inflate with any means at hand in those days and was capable of only small service, because of the deficiencies in manufacturing processes of those days. The new art of vulcanization was so crudely developed at that period that anything like the resiliency and durability of modern tire-making were impossible.

But the Thomson tire was good enough to make all subsequent patents vain.

It remained for John Boyd Dunlop, a veterinary, born in Belfast, Ireland, to revive the art of pneumatic tire-making. Macintosh & Company, however, applied for and took out a British patent on a tire with a hollow center in 1884 and the leading rubber manufacturers of Great Britain held patents of one kind or another covering the vehicle tire at that date. Dunlop's claims were substantially similar to those of Thomson and while he and his associates had formed a large company with liberal capital to manufacture the tire he patented in 1888 and 1889, the only protection of the law that was given to the tire was confined to Great Britain and was not universally recognized even by the courts of England.

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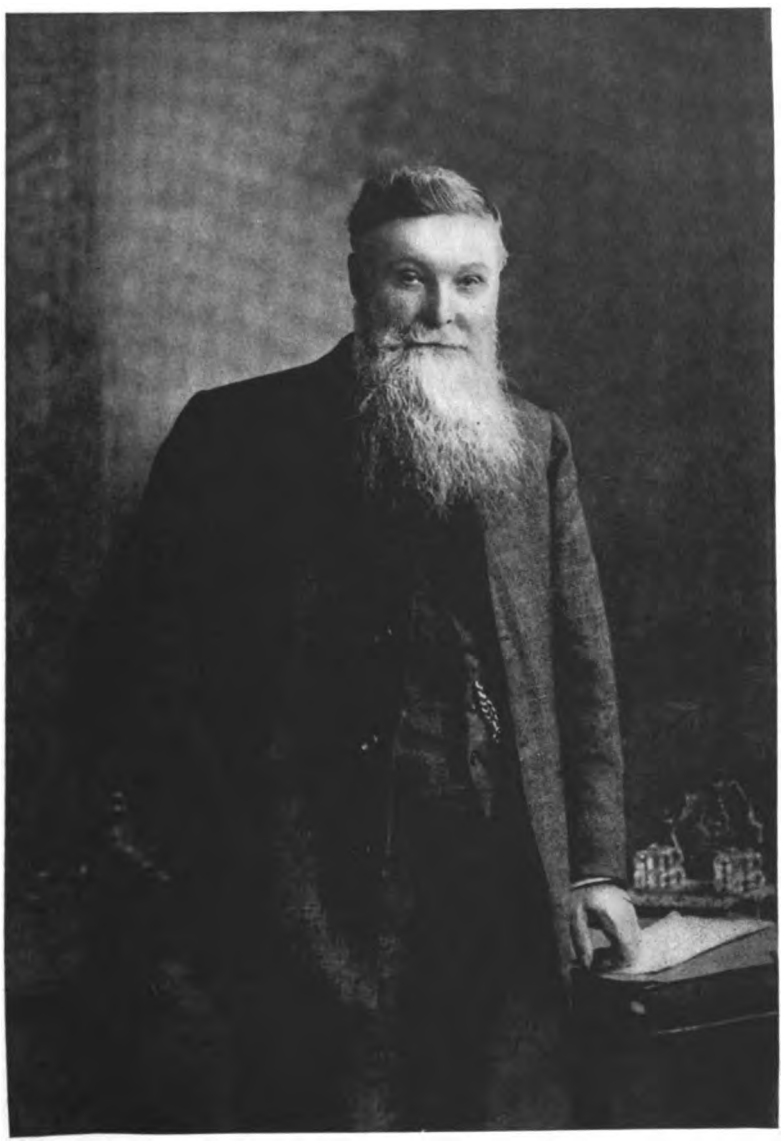

JOHN BOYD DUNLOP
A Pioneer in the Tire Art.

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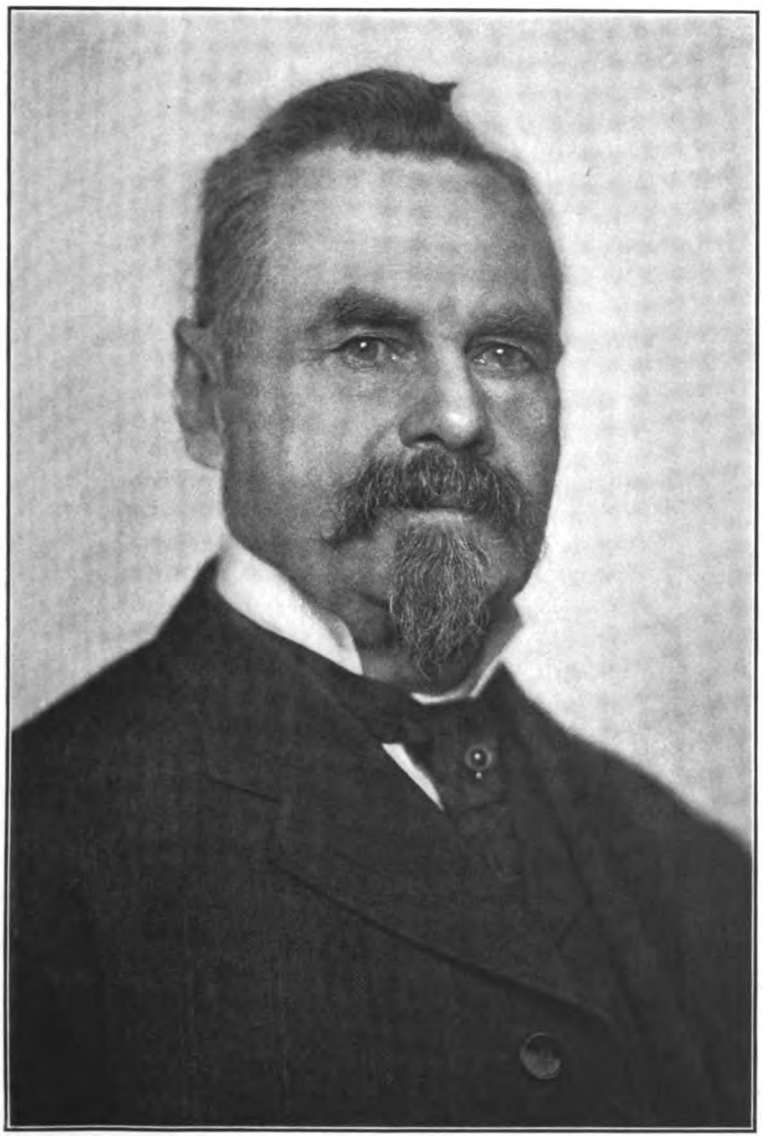

THOMAS B. JEFFERY

Inventor of Clincher Rim. Founder Gormully & Jeffery Mfg. Co. President Thos. B. Jeffery Company, maker of Rambler (now Jeffery) car.

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Dunlop's tire was a bicycle tire consisting of an inflated tube wrapped and fastened with tape and after its manufacture was perfected, its vogue was almost world-wide in a sales sense, even without the protection of the patent law. The company formed was capitalized at $25,000,000 and in a single year made as much as $2,000,000 profit.

The great power of the Dunlop company was given through the ownership of the patent issued to Charles K. Welch in 1890 on a tire shoe based on fabric, which was designed with inextensible edges, reinforced with a peripheral wire to cover a pneumatic inner-tube, but its main feature was the channeled iron rim which clinched the shoe to the wheel.

At the time that the Welch patent came into extensive use A. T. Brown and G. F. Stillman of Buffalo, New York, laid claim to almost exactly the same kind of a rim and tire and a United States patent was issued to them in 1892. The work of Welch and the American inventors were so obviously distinct, despite the fact that their claims covered practically the same ground, that the Dunlop company announced that it would buy the American patent and the sale was actually made involving the payment of $100,000 to the American patentees.

William Erksine Bartlett, an American, living in England, was granted a British patent covering an improved form of the clincher principle in 1890. His idea was for a thickened bead edge instead of the wire used by Welch, shaped and designed to engage a flange made in the clincher rim. Bartlett was managing director of the North British Rubber Company for many years and Dunlop, realizing the value of the Bartlett patent, paid $1,000,000 for it to Bartlett's company, which also reserved the right to manufacture under the patent. This latter provision led to voluminous litigation at times during the life of the patent.

In the United States, Thomas B. Jeffery devised, invented and patented a clincher rim and tire. The patent was issued June 16, 1891. The early development of this tire was restricted to a certain extent by the fact that it was used as equipment on a single type of bicycle, the old Rambler. It had a thickened, shaped bead and regular clincher form of fastening and proved efficient and useful. It was made by the Gormully & Jeffery Manufacturing Company and its representative in the automobile tire field is called the "G & J." The company was one of the components in the merger when the United States Tire

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Company, a subsidiary of the United States Rubber Company, was formed.

Another very early patent that had a distinct influence on litigation but little importance in the actual manufacturing field, was the main patent issued to A. W. Thomas, March 12, 1889, application for which was made in June, 1888. Besides the main patent, Thomas took out six others, all of which interlocked more or less and covered an inner tube construction and a method of fastening to the rim by a series of cross wires. The idea, while interesting and different from the Dunlop, was never of much practical service. The patent described the pneumatic tire, but was limited in its legal effect to the means used to fasten it to the rim.

There was terrific litigation among the early bicycle tire-makers and patentees, Dunlop prosecuting 162 suits in a single year. The early decisions were largely in Dunlop's favor but as the art progressed, the scope and force of his patents were limited by adverse decisions. His main ideas, however, were sustained by the British courts up to the expiration of the patents.

The Bartlett patent came into direct conflict with the Jeffery patent in the United States and England and the first decisions in England sustained Bartlett, while in the American courts the Jeffery device was upheld. Bartlett really anticipated Jeffery and eventually after both patentees had tasted victory and defeat, they reached a basis of agreement to combine their ideas to form the modern type of clincher rim.

The clincher rim is merely a circular piece of channel steel with incurving flanges to hook over the thickened and shaped bead of the tire. The clincher is a hook, nothing more.

Now, while the inner-tube and shoe type of pneumatic tire was old in the art in 1890, the single tube tire was something that had never been developed in practical form until a later day.

A. Boothroyd, a British inventor, made a single tube bicycle tire in 1889. This tire consisted of a rubber inner tube and a rubber tread, separated before taking final form by one or more layers of frictioned fabric and all vulcanized together. Boothroyd thought so little of his invention that while a number of sets of his tire were made and Albert A. Pope bought some and imported them into this country in 1890, Boothroyd never secured a patent on his process.

May 23, 1893, Pardon W. Tillinghast of Providence, R. I., was

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granted a patent embodying the same general idea as that of Boothroyd, for which Col. Pope had secured the American rights to manufacture and sell. As the Tillinghast patent was actually in being in 1893 and as its application dated back of the publication of the Boothroyd idea, Pope and his associates purchased it and eventually the Tillinghast association was formed, with Colonel Theodore A. Dodge as trustee and the patent was extensively litigated and sustained.

This, however, was not until 1895. The Tillinghast litigation served to mark out the fields of some of the other patents, and one of the incidental points covered was the dicta that established the right of the Thomas patents to their claim with reference to a thickened tread.

One of the most important tire patents evolved about that period was the one issued to John Fullerton Palmer on an "all-warp" fabric, today the basis of all the cord tires in the world. In this fabric devised by Palmer, there were no weft threads and the main structural idea was to apply the layers at a large angle to one another and vulcanize them into the tread. This principle was modified in various ways by other patentees and manufacturers, but in its essentials was retained.

Michelin et Cie, the French rubber manufacturers had the honor of first applying the pneumatic tire to the automobile, because the first broad use of the automobile was in France and the necessity for protecting the mechanism of the car from road shocks was appreciated strongly as soon as the automobile began to run. Michelin, located at Clermont-Ferrand, grasped the idea of using pneumatics on the automobile before the Paris-Rouen race and wanted to equip a car or two with such tires in that contest. He met with a discouraging reception and it was not until a subsequent contest that he had the satisfaction of seeing the tires put to an actual test.

He went to Panhard & Levassor, Peugeot, De Dion Bouton and others and offered to supply tires for their racing entries, but was turned down by the manufacturers, who were so engrossed in the mechanical improvement of their cars that they would not listen to anything so revolutionary as the idea of running a heavy automobile on four cushions of air. The automobile manufacturers pointed out that no rubber could stand up under the stresses of racing and that they were too anxious for their cars to make a good showing to undertake any experiments.

Michelin, however, was not to be denied and he solved the problem

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by having a car constructed in his own works, which was equipped with pneumatic tires and ran in the race. The first experience was not particularly encouraging, but, as in everything else, one must creep before walking. The French manufacturer was not discouraged and kept on developing the tire and maintained his determination to have it thoroughly tested until Panhard & Levassor saw the point. From 1895, when the first regular use of the pneumatic tire was made, the world-wide scope, use and service of the automobile was assured.

The B. F. Goodrich Company of Akron, O., was the pioneer tire manufacturer in the United States, commencing business of that kind in 1870 and continuing through the bicycle vogue to the day of the automobile. Dr. B. F. Goodrich "re-discovered" the double tube principle and applied it to bicycle tire-making and was not very far behind Michelin in adapting the idea for automobile use, considering the difference between the French industry and that of the United States.

The Goodrich company early adopted the general idea of taking licenses on various valuable rights to manufacture and in the course of its history secured such notable rights as those embodied in the Palmer patent. Besides making all kinds of rubber goods on its own account the Goodrich company for many years has made tires for various patentees under the individual brands of the owners of the patent rights.

Alexander Straus, a New York business man and scientist, identified with the rubber business for many years, played an important part in the tire industry that has been almost forgotten in the great sweep of the business.

Straus figured in at least one romantic and tragic incident that deserves mention in this work.

September 25, 1894, the United States Government granted him a patent on an improvement in elastic fabrics, the main idea of which was fundamental and which has been used very extensively since then in the tire building art.

The patent covered the process of stretching and frictioning fabric so as to give little or no tendency to yield in one direction, while increasing the ability of the fabric to stretch or give in the other.

For many years fabric flatly within the description of Straus has been used in tire making. In fact, it is hard to conceive of any different type of cloth being used in some tires.

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But Straus never profited five cents' worth on account of his patent. For several years after it was granted, automobile tire-making was too small a matter to bother with from the viewpoint of a big business man and bicycle building was in a decline. He was too busy to enforce or litigate it during the next few years of the patent's life and then he fell ill with a wasting sickness that prevented him from prosecuting his claim during the last few years of his life.

In fact, he forgot that he possessed such a patent until the automobile industry had assumed great importance—and the fires of life were low in the inventor.

Along in the fall of 1911, just a few days after the patent had expired by limitation, Philip Straus, now treasurer of the Hardman Tire & Rubber Company, happened on the original patent papers. In a glance he recognized the importance of his father's invention, and with the documents hastened to Charles R. Flint, with the idea of having whatever rights that were involved safeguarded.

Alexander Straus rallied during the belated effort to establish the patent, but when the report was made by Flint that the application for a renewal had been denied owing to the fact that action had been delayed until after the expiration of the patent, Straus failed rapidly and died.

Some idea may be gained of the importance of the patent when it is realized that a royalty of 5 cents per tire on the 1916 output of the United States would total more than $1,000,000.

The pneumatic tire in the rubber industry was an infinitesimal part until after 1903, except for bicycles. The flattening out of the bicycle industry, which was followed by a marked shortening in the demand for pneumatics, probably had something to do with delaying the development of the tire art in this country, but it may be said that even in the early days of the automobile there were always tires enough for the cars.

To return for a moment for a view of the development of the automobile rim, which as a means of attaching the tire to the wheel has been the subject of so much controversy: Charles K. Welch, inventor of the idea, which with that of Bartlett and Jeffery gave us the clincher rim used wellnigh universally in all the early automobiles, suggested, 'way back in the bicycle days, before anyone had thought of applying the pneumatic tire to the automobile, that the use of a turn-buckle to adjust the fastening of a tire in his wired-on type

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would be a great advantage. At the time the main difficulty encountered was to make the tires stay on the rims. Mosely, another British manufacturer, developed this idea of using a turn-buckle, but applied it to the flange instead of to the holding wires. This had the effect of turning inventive thought all over the world in the direction of detachable flanges and led step by step to the quick detachable and quick detachable and demountable rims, so important in the art to-day.

Between the first Michelin tires, which used similar rim construction to that manufactured by Dunlop, under his various patent rights, and the detachable wire-wheel of current manufacture is a far cry, but the course of development has been steady and certain.

The first automobile wheels were made of wire spokes, heavier and more substantial than bicycle wheels, but really nothing more than a kind of sublimated bicycle wheel. The tires were fastened on with clincher rims and lugs to support them. It was about as hard to change a tire, equipped in that way, as it was with the other style of fastening, known as the bolted-on type, in which strong bolts held the tire to the rim, necessitating a lot of work to unscrew and remove them before the tire could be replaced.

The quick detachable rim extended the scope of automobile use immensely. The detachable and demountable improvements added to the comfort of motoring and widened the field for automobile sales by decreasing the labors and inconveniences that had attended automobile use prior to their introduction. Within the past five years wire wheels, differing to a marked extent from the first wheels of that name to be used in the automobile art, remade their appearance and their use is being rapidly extended.

The form of all pneumatic tires is quite similar. They are all based on one great principle: An air-tight inner tube of almost pure gum rubber, equipped with a valve stem that passes through a hole in the rim and felloe, through which air can be pumped into the tube. The valves, stems, tube and process are all old in the art and were before the day of the bicycle. The inner-tube is enclosed in a strong casing, held firmly to the rim by the fitting of its bead into a steel channel. The pressure of the air aids in this gripping process as has been proven on many occasions where deflated tires have been thrown with great force from the wheels in speed contests.

The shoe is made of a carcass of fabric, either in the form of woven duck or of cords, as in the Palmer construction. In either case the

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cotton fabric or cord is impregnated with gum rubber and is made into the form of a tire on a metal shape. The bead is constructed around a core of hard rubber and the tread is applied. The tire is then subjected to heat in a calendering machine, either by steam or some other means until the process of vulcanization has been perfected.

Each manufacturer has his own process, but in the main the one outlined is followed. Tires are not cast, or run into molds, but are built, mostly by hand. Some are wrapped; some are molded, as to tread; some are cured only once, and others have to be put through the calender twice.

Nothing has been discovered, so far, that will take the place, nay, more—will even approximate—air, confined in a pneumatic tire for automobile purposes. Several ingenious efforts have been made to substitute something else for air, and one of them, at least, has been of some service. But the fact of the matter is that the automobile is based primarily on speed and the substitutes for air do not take kindly to the effects of high speed and the stresses of operation, no matter how useful such devices might be at moderate speed and under comparatively easy conditions.

Theoretically, the pneumatic tire of 1915 is close to perfection.

The business of tire-making is one of the great industries of the United States. So far as the automobile is concerned, it began to be a factor rated among the important phases of industry in 1903. The first effort of the tire manufacturers was to supply equipment orders to the automobile factories. But as the volume of automobile production increased and as the quality and stamina of the cars improved the amount of tire business veered from the manufacturer of automobiles to the consumer.

At the end of the manufacturing season of 1916, say about June 1, there will be approximately 3,500,000 automobiles in the United States. The automobile manufacturer furnishes at least four tires with each car sold, and so from first to last the total factory business supplied to the tire men from the automobile makers for tires sold on their cars to consumers, probably has not exceeded 15,000,000.

That volume of business is by no means unimportant, even though it has been spread over a period of a dozen years, but it is a mere drop in the bucket compared with the total. If cars average five years in service, and they do, and if they average 8,000 miles a year, which is

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a conservative figure, they use from six to eight tires a year, or say 35 tires during the life of each. Thus the tire makers must figure on supplying 35 tires for each automobile made and the car maker only furnishes four to his customer when the car is sold.

It is by no means an extreme view to take, to estimate that the 1916 consumption of tires will exceed 23,000,000, of which about 5,000,000 will be used in new car equipment. Thus the most important market for tires has shifted from the maker of automobiles to the user of automobiles.

The figure used as an estimate of tire consumption does not take into account the important item of export business, which is more fully covered elsewhere.

The tire business of the United States for 1916 will amount to $400,000,000 at a conservative estimate, about half of which is centered at Akron, Ohio., the center of the rubber industry of the world. Reckoning the tire output of the country for domestic purposes at seven tires per car and the number as 3,500,000 cars in service, the tire makers must turn out an average of over 70,000 shoes per working day! The total volume of business exceeds the value of automobile production in 1910 and represents a total of more than 50 per cent. of the probable car business of 1916.

The automobile tire business is one of the romances of the automobile industry.

THE ROMANCE OF THE CRUDE

Rubber, which in the form of the automobile tire is the cornerstone of the motor fabric, is a product of the tropics. The first record of it among civilized peoples dates back to 1730, when a group of French scientists brought back samples of gum elastic from South America. In 1770 Dr. Priestly, a British educational writer, suggested a use for gum elastic in a work he wrote on the subject of drawing. Dr. Priestly said that the gum could be used for erasing pencil marks from drawings; that it could be used to rub out the marks—hence the name rubber. It was called India rubber because it was supposed to have come from either the East or West Indies.

While there are a score of trees capable of producing rubber, only two are really important at this stage of development, the Hevea

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Brasiliensis and the group of species from which caucho is produced, designated as Castilloa. The Hevea is the source of all rubber classified as Para, which in its various grades constitutes the commercial rubber of the world, so far as tire making is concerned. Caucho is used to some extent and with some success, but the backbone of the rubber industry in the automobile aspect, is Para.

Rubber shoes were first brought to this country in 1820, when a sample shipment from the Amazon was imported at Boston. The novelty of a footwear capable of keeping the feet dry in wet weather was attractive and the samples were eagerly purchased.

In an incredibly short time, the trade grew to 500,000 pairs a year, all of which were imported. The Yankee spirit, however, soon changed that situation by installing numerous large rubber factories, where they made quantities of rubber goods from stock imported from the Amazon. Mackintosh cloth was invented and made and the trade assumed national size and scope.

But it was based upon a bubble which promptly burst. The difficulty with rubber manufacture was that while the smoked gum retained its form for a while, it melted and decomposed with painful readiness in summer and lost all elasticity in cold weather.

Rubber is the white, milky "latex" of the rubber plant. In the savage wilderness of the Amazon it was collected by natives, who used a certain rough skill in all their operations. The practice in use about 1820-30 was to cut a series of gashes in the surface of the tree, leading them to a central point, where the latex oozing from the cuts, flowed down and collected in a receptacle formed for the purpose from clay. About a gill per day, per tree, was the usual yield and this was collected by the rubber gatherers and taken to their huts, where it was coagulated into "biscuits," by dipping a paddle into the collected latex and smoking it until it was fairly dry over a fire fed with a certain kind of palm nut. This fuel produced a thick, greasy smoke which permeated the latex and gave the biscuits consistency and form. The process of making the biscuits was simply to repeat the dipping and smoking until the lump of rubber became so large that it was unwieldy.

These biscuits were loaded into ships that made the Amazon ports of call and were imported into New England in some volume before 1830. In 1836 the Para production was 416,000 pounds, of which a large proportion, probably around 60 per cent., came to the United

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States. Ten years later, which was the year after Goodyear patented the process of vulcanizing rubber, the production of Para was 482,000 pounds. It was over 4,000,000 pounds in 1856, nearly 12,000,000 in 1866; 17,000,000 in 1876; 28,000,000 in 1886; 43,000,000 in 1896, at the height of the bicycle demand on rubber for tires; 62,000,000 pounds in 1906, after the automobile began to be felt as an element in the demand for rubber, and in 1913 was over 72,000,000 pounds. It has been estimated that the production of the Amazon country for 1916 will probably be not far from 85,000,000 pounds.

But since the automobile has come, another factor has entered the production of crude rubber—the Mid-East plantations. From a production of nothing in 1900, the plantations of Malaya, Ceylon, Sumatra and other tropical sections where the cultivation of rubber has been developed with skill and energy, reached a total yield of 40,000,000 pounds in 1915 and will probably exceed that volume by from 12,000,000 to 15,000,000 pounds in the current year. Likewise the production of caucho, in South America, which reached a volume of 22,000,000 pounds in 1913, is expected to be approximately 30,000,000 pounds in 1916.

Other countries—in fact, nearly all tropical lands—produce and ship varying quantities of rubber, mostly of inferior grades and not available for automobile tire-making. The total rubber yield of 1916 has been estimated at from 120,000 to 135,000 tons, of which under normal conditions the United States would receive a little over half. On account of the great war in Europe, it is quite likely that American importations of rubber will be nearer 75 per cent than 50.

One reason for the increase, aside from the war, is the tremendous volume of the tire business. An automobile tire contains, roughly, one-quarter by weight of pure gum rubber, or an average of about five pounds per tire. If the 1916 tire production is 23,000,000, it will take 115,000,000 pounds to supply that branch of the rubber trade. Of course, it should be noted that the consumption of 1916 will be away and beyond that of any preceding year, but some idea of the volume of the tire demand on the crude rubber supply may be gained from the fact that in the first eight months of 1915 the official figures show that the gross importation of rubber into the United States was 140,745,276 pounds, or only about 20 per cent. greater than the prospective demand for tires alone in 1916. The final figures for 1915

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will probably show a gross importation of 200,000,000 pounds of crude rubber, and on the usual basis of division between the tire-making trade and the other users of rubber, the total importation in 1916 will probably account for nearly every pound of crude that can be grown, and that can be spared by the industry in other countries.

In the fall of 1915 the British Government announced the imposition of a tax of 2½ cents a pound on all rubber exported from its Mid-Eastern possessions, which under normal conditions might have been counted upon to reduce the yield of rubber. But the extra demands that must come from the tire-makers can have no other effect than to stimulate the producers to turn out even larger yields than their estimates have embodied.

The plantations will have to bear the bulk of the increased demand and they constitute the most promising field in which to search for a greater supply of rubber capable of use in the automobile tire industry. The situation is this: The plantations that are now yielding rubber are composed of young trees. The hevea is not a particularly delicate tree and will yield increasingly up to a point of age that has not yet been determined with accuracy. It begins to yield a little when it is five years old, but when it is thirty years old it produces copiously. The plantations of the Mid-East are very young; the acreage of trees too immature for tapping in 1916 being a very considerable percentage of the total ground covered by the plantations. Only a few, comparatively speaking, of the plantations are in full yield, and it is only reasonable to suppose that when the young trees come into bearing and the tapped trees grow larger, that the total production will increase. The progressive steps toward equality with the Amazon country in the matter of rubber yield must carry the Mid-East to the front, if not in 1916, then sometime in the immediate future.

The importation of rubber into the United States was 18,000 tons in 1895 and over 60,000 tons in 1915. The total value of rubber manufactured products in the United States in 1915 was about $400,000,000, which is about what the total of tire business in 1916 will be. Thus it can be readily seen that the importation of rubber in 1916 will be at least 90,000 tons, perhaps more.

At the beginning of the automobile industry in the United States, tires were imported in about the same proportion as cars. Michelin and those manufacturers who followed him had a start on the Ameri-

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can manufacturers in that they had a factory trade to supply long before the United States was in such a condition. The French automobile industry was booming along when there were only three cars running in the United States, and it took the American industry some time to catch and pass the Europeans. That point was reached when importations of automobiles fell below the total of American manufacture in 1904, and from that time the exportation of American made tires has been a growing and thriving element of the industry.

The same factory methods that have produced the triumph of the American car are working to produce the triumph of the American tire, as a commercial element.

A few tires began to flow out in 1904, but the great boom did not start until the war closed the foreign industry and left the hands of the American manufacturers free to supply the world with their goods. During the first eight months of 1915 the American manufacturers exported $5,509,000 of tires, including solids, which means a total export for the calendar year of not far from $10,000,000.

With regard to the cost of producing rubber, it may be said that in times past the rate paid for producing Para was 40 cents a pound, shipping and handling charges extra. To-day it is considerably less and methods of gathering and shipping have been improved despite the class of labor that does the actual work in the Amazon swamps. The cultivated rubber can be produced and sold at a profit on a basis of 25 cents a pound when the trees are a little older and the yield per tree increases according to the normal expectation.

The scientific methods applicable to plantation rubber and which point to a gradual lowering of its price in the markets, are the barrier against which the chemists who have been seeking a suitable substitute for crude rubber by synthesis have been stopped. Synthetic rubber, possessing all the good qualities of the natural product, can be made and has been made, but its cost is prohibitive. Synthetic rubber tires have been made that equalled the performances of natural rubber tires, but they cost dollars where the regular tires cost cents.

Until the processes by which synthetic rubber is made can be simplified so that the cost of the product can be reduced to a competitive basis, the natural rubber producers have nothing to fear.

The rubber market of the world is in London, where the supply of the plantations and a good part of the Brazilian rubber is shipped and sold at semi-monthly auction. In the readjustment of commerce

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HARVEY S. FIRESTONE
President Firestone Tire & Rubber Co.

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HORACE DE LISSER
Ajax Rubber Company.
Scientist, Executive, Financier.

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SENECA G. LEWIS
General Manager Pennsylvania Rubber Company

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HAROLD O. SMITH

Officer of old G. & J. Mfg. Co., who later was president Premier Motor Mfg. Co. and now has returned to the rubber industry.

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after the war, it is likely that New York will have a more important status as a primary receiving point than it ever held before, but as the plantations are very largely British, London will probably remain the main market within measureable time.

ASSOCIATED WITH THE TIRE

Henry C. Pearson, editor of *The India Rubber World,* and most eminent authority in the field of rubber literature, in his "Rubber Tires and All About Them," makes a few general statements in introducing his very excellent work that are of special interest to automobile makers and users—also tire manufacturers.

Mr. Pearson says that many in reading the instructions on the use and abuse of tires issued by rubber manufacturers must feel about the way the average citizen does when he reads patent medicine advertisements, the reports of food cranks, and on the broad subject of the state of matrimony, and may have a tendency to follow the advice given on the subject of getting married, which was: "Don't."

He explains that the tire is designed for hard service and that if it will not give such service, it is a poor tire. He says that half the fun of owning a car is in one's ability to get away from beaten paths through its instrumentality. "If one must stay right along with the procession," says Mr. Pearson, "what's the use of owning a car?"

When one leaves beaten paths one leaves good roads, or at least can not rely upon finding good roads all the time. Consequently, the satisfactory tire is the one that will allow its owner the widest latitude of action.

If the tire will not "stand the racket," it is not a satisfactory tire.

But, without intending to infringe upon the prerogative of the tire-makers who issue long and detailed statements and instructions as to the care of tires, some of which are enough to raise a doubt in the mind of a normal human being about the quality and service of all tires, certain things have been developed along with the progress of the automobile that are important to the life of tires.

Mr. Pearson says that the whole theory of tires is to promote comfort for the user of an automobile while protecting the mechanism of the car from undue vibration. One other element might be added, which is to secure satisfactory mileage.

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First among the additions made to the tire art should be mentioned the pump, by which pressure of air can be put inside the tube. It is extremely uncertain how the Thomson tire was inflated back in the 40's and still more uncertain how the driver of one of the horse vehicles equipped with Thomson tires managed to replenish his supply of air in case of puncture while on the road. Probably he did not, for the tire fastenings of that day did not lend themselves to easy replacements.

It was not until 1898 that any real progress was made in the direction of pumps and then it was not a development of the bicycle pump that came to the aid of the automobile. President Kellogg of the Kellogg Manufacturing Company, of Rochester, N. Y., was in Connecticut attending a convention of surgeons and medical men with the idea of interesting some of the physicians to recommend the purchase of a new type of pump that Kellogg had devised to spray llanolin, a wool oil, in their professional work. This oil is heavy and requires considerable force to apply it, and the Kellogg pump was substantially built and capable of developing much pressure.

At the convention he met A. L. Riker, who at that time was engaged in building a small steam automobile, and Riker, happening to hear Kellogg explain the llanolin pump, became interested. The upshot of the matter was that Riker ordered several dozen of the pumps to be used in inflating the pneumatic tires with which his cars were equipped, and since then Kellogg has been busy supplying the automobile manufacturing trade.

The early pumps were good and did excellent service, but the fact remains that for years the terror of motoring was tire trouble. In summer heat the pumping of a large tire by hand was an exceedingly trying task. In winter it was little better. At no season was it agreeable work, because it was back-breaking and exhausting to a degree. The last trench of a considerable portion of the former horse devotees was that they preferred to retain Dobbin rather than have apoplexy from using a tire pump. Blistered hands and ruffled tempers were the least of the consequences of punctures on the road.

There is nothing patentable about the main principles of a pump for any purpose whatever, and so the tire pumps of motordom have been developed without protection of the law. A considerable section of the industry, interested in the manufacture of accessories, focused attention on means that would lift the labor of pumping tires from

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the back and shoulders of the motorist. They devised various means for filling tires, including the use of liquid air, so-called, and other liquefied gases. These improvements served a small purpose, but did not answer the main question, and it was not until the motor-driven pump, actuated by the engine of the automobile itself, was perfected, that the tire trouble was robbed of its terror. The power pump is not required often, but whenever it is needed and performs its service well, it adds more value to the automobile as a vehicle. The pump is an important, constructive factor in the growth of the automobile industry.

The most important element in the life of the pneumatic tire is full inflation. The pump is necessary to provide the inflation, but it would take an expert to tell by the feeling of the tire or its looks whether it had enough pressure in it. Sufficient pressure is important in several ways. First it is what the tire was designed for; second, a fully inflated tire gives more miles to the gallon of fuel than one that is under-inflated; it being obvious that the outer circumference of the driving wheels of an automobile, equipped with fully inflated tires, must be larger than those the tires on which are soft, allowing the car to flatten the tire anywhere from a half inch to an inch while running. The fully inflated tire does not require so many revolutions to the mile as the other, and consequently will deliver more miles per gallon of fuel.

The only safe way to tell whether a tire has the recommended amount of air pressure is to test the pressure with a gauge. There are numerous types and styles of tire gauges, none of which costs much, and any standard gauge will do what is claimed for it. The fundamental patent in the tire-gauge field is the Twichell patent, which was sustained in the United States District Court and has been accorded acquiescence pretty generally in the trade. The tire-makers recommend in a broad sort of way a pressure of twenty pounds to the square inch, for each inch of tire diameter. Thus in a 3½-inch tire the recommended pressure would be 70 pounds to the square inch, and a 5-inch tire would take 100 pounds pressure. Guarantees depend upon the way air-pressures are maintained, and the only way to be sure that one has the rated pressure is by using a gauge.

The non-skid tread is an important element in the art of tire-making. The idea is to prevent side-slipping and loss of control of the car. The Michelin Semele tread was probably the first in the line of

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automobile non-skids. This is a faced tread bearing rows of metal studs to grip the pavement. In the bicycle days there were various kinds of non-skid treads, and when the automobile developed nearly every tire-maker grasped some distinctive form of non-skid tread and applied for patent rights.

The old Bailey tread, consisting of a series of knobs, was in force under patent until the patent expired. The Midgeley tread, embodying the idea of coiled wires embedded in the tread; the Republic Staggard tread; the Nobby, of the United States Tire Company; the distinctive Firestone tread, bearing the words "Non-Skid," the Goodrich type; Goodyear diamonds; Pennsylvania vacuum caps, and, literally, there is a special non-skid tread for every company essaying to make a tire.

Every one of them was good, but not so good as some salesmen in each company said they were.

They all will prevent skidding, in many cases. Under good average road conditions, at moderate speed, the non-skid tread has been demonstrated as a valuable thing.

Some of the hardest fought litigation in the industry has resulted from legal battles over the alleged infringement of patents covering non-skid treads. The Mell patent of the Republic Rubber Company was sustained in the lower court in a suit brought against the Morgan & Wright Company, but the upper court destroyed the patent and reversed the case. Royalties are being collected on account of one tread patent at least, but otherwise the field is peculiarly open, not to say barren of possibilities. The decisions of the upper courts have declared the main idea of a non-skid tread of the ordinary type to be non-patentable.

The tire, in a rough sort of way, may be described as being composed of one-quarter pure gum rubber, one-quarter cotton duck, fabric or cord, and one-half chemicals used in vulcanization and compounding.

All about the gum rubber is told elsewhere, and nobody is supposed to know what the tire-makers put into the rubber. That leaves the duck, fabric or cord.

Tire fabric is made of specially well-woven cotton duck, manufactured from long fiber staple, which in some cases is the celebrated Sea Island type, sometimes long Egyptian and sometimes a specially long, fine cotton grown on the mainland. It is quite likely that the

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tire-making industry in 1916 will use over 115,000,000 pounds of cotton in manufacturing, or a matter of 230,000 bales each weighing 500 pounds. This cotton cloth is expensive and has to be well made because it forms the basis of the strength of the shoe.

In the ordinary types of pneumatic tire the plies of fabric number from four to ten, averaging about seven. In the cord tires there are fewer plies, but the substance is thicker. There is at least one type of inner tube in which fabric is used.

Mr. Pearson says that the whole process of rubber manufacture consists of washing the crude to remove impurities; mixing the crude with chemicals to form the desired combination; applying the composition to whatever purpose desired; manufacturing, and then vulcanization.

In tire-making he points out that tires are not run into a mold in any case, except that solid tires are made by filling a hopper with composition, which is then pressed through a protuberance from the inside, emerging in molded form, and that such a process is not universally used in the making of solid tires.

CHARLES GOODYEAR

The man who gave rubber to the world, supplying the means through which an industry with an annual turn-over approaching the billion-dollar mark was started, struggled through a life full of sickness and sorrow and died broke. Thus has it been with frequency in the history of invention and the tragedy of the life of Charles Goodyear, inventor of the process of vulcanizing rubber, through which a sticky tropical gum may be metamorphosed into one of the most important commercial elements of to-day, is one of the saddest ever chronicled.

Goodyear, a dreamer of dreams as well as a man of action, was delicate all his life. His mind held just one thought from the day he first became interested in rubber, and the privations that he underwent could not shake his indomitable grip on his purpose to find some means of making rubber usable commercially. He was called every contemptuous name in his hours of trial, that were scarce tempered by the adulation that was heaped before him for a few brief moments toward the end of his days. He wore out the patience of his friends

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and relatives, and, it must be noted, put several of them dangerously near the bankruptcy courts. He was called crazy, as was Selden, but the Rochester wizard had the advantage of station and did not have to fight for bread to keep soul and body together, while Goodyear did.

The Father of the Rubber Industry, of which the automobile tire-making art is an important part, and thus the Father of the Automobile Industry, as well, was born at New Haven, Conn., December 29, 1800. He commenced his research and experimentation with rubber about 1830 while confined in jail for debt. He was married and had a dependent family at that time and in addition was a confirmed invalid.

His incarceration was the result of his neglect in failing to perfect himself in some trade and to work at it, but it was caused directly by reason of his interest in rubber. When the first crude shoes were imported at Boston, and had found a ready market, the trade began to grow amazingly, and in due course rubber was imported and manufactured in this country. Goodyear got hold of some of the product of these factories and some of the crude gum rubber, going in debt for the amount of the purchases. When he did not pay for the goods he was thrown into jail. Of course, he had other debts as well, and the rubber creditor was only one of several complainants.

Goodyear had plenty of opportunity to ponder and study over the problem while serving his time. He got hold of some literature and records of manufacture and sale of rubber goods, and found that the universal experience of the manufacturers of that day was that while the smoked rubber retained its form for a short time, it softened at about 100 degrees Fahrenheit and melted into a state of fluidity at 200 degrees. Goods made in the fall or winter of a year decomposed the next summer, fermented and produced an indescribable odor.

After he got out of jail he began a series of experiments in mixing crude rubber with other substances in order to correct its stickiness and to give it a permanent form. One of his discoveries was that by mixing 50 per cent. by weight of magnesia, he got a white compound that was not sticky on the surface and gave promise of retaining its shape. So eager was the public to get into the rubber business at that time that Goodyear, armed with his magnesia process, was able to interest a little financial help, and his idea resulted in a small amount of manufacturing. He was on the wrong track, however, and while his new rubber was white and all other kinds of that day black, his

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white rubber melted and decomposed and smelled quite as bad as the others.

Thus he exhausted one means of finance and alienated one set of friends and business acquaintances.

Poverty-stricken once more, he removed to New York City and with his eldest daughter, a girl of extraordinary tenacity of purpose and belief in the genius of her father, took a room in old Greenwich village, down about where the silk center was before 1910.

Goodyear worked for wages occasionally, at anything that came to his hand, but until 1837 he and his daughter labored not only to keep alive but to provide the funds and the means for continuing his experimentation.

Goodyear was making some rubber drapery one day in 1836, and after covering a bit of fabric with gum rubber he immersed it in a bath containing lime and bronze powder. By some chance he added some nitric acid to the bath, and when the fabric was removed he saw that the rubber was discolored and he threw it aside. After the stuff had dried he saw that the surface of the rubber was without any of its former sticky quality and that the action of the chemicals had served to effect a cure of the rubber, so far as the surface of the material was concerned in any event.

Goodyear rushed to find his daughter, crying that he had discovered the long-sought process and that their troubles were at an end. He was so enthusiastic and confident that he was able to interest capital sufficient to allow him to work further with the process, which he designated as the "acid-gas" process. Using this method, he made quite a little rubber and had some remarkably perfect maps made from it, which he sent to England with the idea of interesting manufacturers to take up what he thought to be the solution of the whole problem.

But in the financial disturbance of 1837 the capitalists he had interested in his idea were bankrupted and other possible sources of financial assistance were closed by reason of the panic, and, to make matters worse, he discovered that while the "acid-gas" process accomplished a surface cure, it did not extend deep into the rubber. Consequently, the center of the material was quite as raw and sticky as the surface had been before being subjected to the bath.

In the moment of his prosperity he applied for a patent on the process and it was finally granted and the patent issued June 17, 1837.

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Goodyear was in the last extremities for means to live in 1837, and one day, when all his scanty furniture was gone, he approached Commodore Vanderbilt, who was conducting a ferry line at that time, and pawned his umbrella for several ferry tickets.

At the very last possible moment help came to the inventor. He devised an improvement on the existing method of making rubber shoes, and between the summer of 1837 and the spring of 1838 he received about $4,000 in payment for his patent. With this, to him, liberal sum, he was able to pursue his experiments in comparative comfort, and its possession was probably the direct cause of his later discovery.

In the summer of 1838 Nathaniel Hayward, a workman who had been employed in a rubber factory at Woburn, Mass., which, however, had been closed down, not only because of the panic of the preceding year, but also because of the failure of its product to give satisfaction, was given the privilege of working in the idle factory, and Hayward, being of an investigating turn of mind, despite his lack of education, happened on the idea of mixing a small amount of sulphur with gum rubber and then, by subjecting the mixture to the "acid-gas" treatment devised by Goodyear, he was able to produce a cure that was better than anything that Goodyear had attained.

Hayward patented his process and acknowledged the use of the "acid-gas" treatment in the application. The patent, number 1090, was granted and issued February 24, 1839.

Goodyear, with funds in his pocket, received a copy of the patent from Washington and as soon as possible set off for Woburn, where he met Hayward and in brief negotiations purchased the patent rights of the Massachusetts workman for a small cash payment.

This payment and his expenses since receiving the $4,000 finished his money resources, and before he was able to turn the Hayward process into more funds he discovered that while the cure made by the Hayward and acid-gas processes was better than anything that had preceded it, it was only slightly more thorough than the others.

Below the surface the rubber remained uncured and decomposition caused goods made under the combined processes to fall to pieces almost as readily as the product of his former efforts.

Up to the fall of 1839 it had not occurred to Goodyear to try the effect of heat on the mixture of rubber and sulphur. He knew from his experimentation that pure gum rubber melted at about 200 degrees

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Fahrenheit, and he was not deeply enough versed in analytic and synthetic chemistry to estimate the result of heat applied to rubber and sulphur, even if he had thought of it. He was absolutely without influence; the friends who had put up money in the past were either alienated through losses of money or crippled financially. But Goodyear persisted.

In the depths of the New England winter he sometimes called his acquaintances together at his humble home and talked about the phantom that appeared to him to be so near capture. One night several of his relatives were present, sitting around the stove in the kitchen of the Goodyear home, while the inventor discoursed on the one subject.

He held in his hands some gum rubber in which sulphur had been mixed.

Goodyear used forcible gesticulations to emphasize his belief in rubber, and in one of these sweeping movements of his arm he touched the hot stove with some of the gum rubber.

It was a cold night and the fire was roaring up the chimney, and even where he touched the stove the iron was hot.

The room was filled with acrid fumes from the burning rubber, but, to the astonishment of the inventor, the ounce or two of rubber that remained on the stove hardened and charred without melting. He stood before the little mound of vile-smelling rubber and watched until it was almost incinerated. Then, rushing to the kitchen table, he seized a knife and scraped the residue from the stove, while his relatives looked on with full conviction that Goodyear had finally gone insane.

He took the ashes around in front of the stove and examined them feverishly, and was rewarded by discovering a tiny, unburned particle which he carefully washed to remove the ashes and found to be *Cured Rubber.*

He had discovered by chance the vital link in the chain that to-day unites the forests of the Amazon, through a giant industry, with the automobile and serves mankind generally wherever rubber is used.

But on that wintry night in 1839 he failed to convince even his lion-hearted wife and daughter of the importance of his discovery. His other relatives were distinctly unbelieving. They had experienced a series of financial blows through the former fruitless efforts of

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Charles Goodyear, and they did not propose to give him either belief or money support.

Far into that night the inventor, with his dream made real before his eyes, sat in front of the hot stove, holding a bit of rubber stock where it was exposed to the heat. After midnight he arose and picked up a strip of material from the receptable in which he had baked it before the fire; stretched and snapped a thick rubber band that showed no signs of stickiness, was elastic and apparently permanent in size and shape.

He took this band outside the kitchen and nailed it to the door to remain in the intense cold until morning. Then he went to bed with the full conviction that he had reached the right path at last. In the morning he found the rubber unchanged by the cold.

For two years he tried constantly to gain the support of his friends and relatives, but it took all that time for Goodyear to convince one member of his own family that he had made a great discovery. In 1844 he felt that he could wait no longer to file his application for patent rights and the fundamental patent covering vulcanization was issued to him in that year.

That was the end of the actual physical privations of the family. There was no more starvation and misery for his calm-eyed wife and brave daughter. Goodyear's discovery—real this time—met with early recognition. He never received much actual cash from his invention that has made hundreds of millionaires, and some of the licenses he granted would make a business man weep. Credited by his fellow-citizens with a large income, Goodyear merely made enough out of his invention to allow him to pursue his investigations without hunger and with sufficient capital to supply him with materials, books and apparatus.

One day a visitor called at his New York headquarters and asked for Goodyear. He was informed that the inventor was not present. The man wished to know how he could identify the inventor, and the person in charge of the place replied: "When you see a man wearing a rubber cap, a rubber stock, rubber coat and waistcoat, rubber shoes, and carrying a rubber purse without a cent in it, that's Charles Goodyear."

The life of the patent was seventeen years and its expiration date was 1861, and it was bitterly contested in the courts, but finally sustained by the tribunal of final resort after a trial in which Daniel

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Webster acted on behalf of the inventor and Rufus Choate fought against Goodyear. Webster, in a magnificent oration, filled with the imagery of which he was the master producer, carried the day. It is said that Daniel Webster received a fee of $25,000 for his services. If he did, it is likely that he made more out of the Goodyear patent than did the inventor himself.

The latter years of Goodyear's life were pitiful indeed. One day decorated with the gold medal of honor by the French Emperor and the next thrown into a French prison for debt. One day lauded to the skies by scientists and the next criticised for his improvidence in failing to provide for future contingencies.

In June, 1860, while he was abroad, Goodyear learned of the serious illness of a member of his family, and immediately embarked for home. He reached New York in the last week of June, on the verge of collapse and was removed from the ship to the old Fifth Avenue Hotel, where he died July 1.

Upon settlement of his estate it was found that there were claims in excess of all assets totaling nearly $200,000. A good part of these claims, however, were the result of poor business judgment of the inventor; hard bargains into which he was forced by necessity to secure funds at various periods, and the general careless improvidence of the man who has only one idea.

Crude rubber sold at 5 cents a pound at certain times before Goodyear discovered the method of vulcanization. In April, 1910, the price touched $3.10 a pound.

While it is doubtful that Goodyear ever saw an automobile, even though he traveled rather extensively during the later stages of his life in England and France and exhibited at several of the great expositions of that period, he knew that his process was carefully considered as a means of supplying tires for vehicles, because R. W. Thomson's basic tire patents in England, France and the United States were founded on vulcanization and Goodyear watched the patent office like a hawk.

Probably if Goodyear could see what his invention has done in the way of revolutionizing transportation, he might reckon the privations of himself and family as naught compared with the general good, but the fact remains that the inventor, unappreciated, scorned and starved through a considerable part of his life, died—broke.

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H. A. WICKHAM

Brazil, the native heath of the Hevea Brasiliensis species of rubber tree, never intended to allow her monopoly to escape, and if the South American country, which in 1870 was a Portuguese dependency under the rule of a puppet king, had succeeded in that endeavor, the world to-day would be dependent for its supply of high-grade rubber upon the Amazon forests, the labor of wild Indians, and the uncertainties of primitive transportation.

The Marquis of Salisbury gave his indorsement about 1870 to a commission of scientists to investigate the rubber situation in Brazil, and among the party that left England for that tropical country was H. A. Wickham, an adventurous sort of person, possessing many of the qualities and temperamental defects of pioneers, as a class.

It is doubtful that Lord Salisbury commissioned the members of the expedition to break the Brazilian law, but Wickham and some of the others took it for granted that they had a distinct reason for going to Brazil beside the ostensible scientific research.

Wickham settled at Santarem on the Amazon at the confluence with that stream of the Rio Tapajos. He secured a plantation containing a few splendidly matured specimens of Hevea Brasiliensis and put in his time clearing the land and planting young Hevea trees, while he waited for—Opportunity.

The seed of the rubber tree is delicate and does not live long under any kind of severe treatment, or, in fact, under treatment and climatic conditions that do not closely approximate those of its native place.

Wickham prepared lined hampers to protect the seeds from changes in temperature and on several occasions was fully ready to do his part in smuggling them aboard outbound vessels, but something happened each time and he was forced to abandon the attempt. He was fortunate in one thing, however, for through his entire effort to smuggle out some of the seed his purpose was never suspected by the authorities.

In the spring of 1876 he had made ready for what he believed to be his final effort to accomplish his purpose, and, learning in a quiet way that the British steamer *Amazonas,* without cargo or the means of securing one at Para, was lying at that port awaiting mail orders from her owners, he slipped down from Santarem to Para and had a conference with the vessel's master. The captain proved to be a ven-

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turesome sort of fellow and listened carefully to Wickham's plan, which was to ship the seeds boldly to the port authorities at Para under the guise of "rare botanical specimens." The seeds were then to be transferred to the hold of the *Amazonas,* carefully packed to protect them from chill and dry heat, and, having secured clearance for the vessel, to make full speed to the island of Ceylon.

Wickham knew that the scheme was full of peril, and that even if it succeeded the chances were that not a single seed would germinate after the long sea voyage. But he chartered the ship and went back to Santarem to superintend the shipment of the seeds. He had a number of hampers all made up, but at the last moment found that the seeds had been packed so long that they were almost certain to fail, even if the *Amazonas* managed to get away.

But at that juncture a new collection of seeds, including some from the matured trees of his own plantation, was at hand, and he deliberately dumped out the seeds that had been collected and filled his hampers with the fresh nuts. His plan of consigning the seeds to the port authorities worked excellently so far as avoiding interference at Santarem was concerned, and in due time the shipments from upriver were received at Para, given only a perfunctory examination and were allowed to be placed in the hold of the *Amazonas.*

Clearance was secured for the vessel, and she sailed at the top of her speed for Ceylon, arriving there in June, 1876, with her small shipment of rubber seeds. The shipment was turned over to the authorities of the Kew Gardens, where the seeds were planted and attended with the care one is supposed to give one's children. Nearly all the seeds were dead, but out of the thousands shipped about a dozen of the seeds from Wickham's own trees sprouted in the warm and genial soil of Ceylon. Three of the sprouts matured and developed into typical Hevea Brasiliensis trees, and all the rubber plantations in the world to-day, outside of Brazil, had their beginning from seed developed from those trees.

Brazilians have never forgotten, or forgiven, Wickham, but the rest of the world, including England, has allowed his service to slip into the cloud of forgetfulness. He still lives (1915) and, while the rubber industry appreciates what he did, few outside even remember that this spare, wiry Englishman took his life and liberty in his hands and staked them against the hazard of widening the field of rubber production.

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But for Wickham's service, one of two things would have happened—either the price of rubber would have long ago reached fabulous figures, thus automatically checking the use of rubber in commerce and manufacturing; or it would have resulted in the monopoly of the crude rubber supply by the automobile tire industry. In any event, the number of tires produced would have been small compared with the current volume and the price would have been very materially higher. Wickham's desperate chance, successfully taken, has nearly doubled the world's potential supply of rubber. It has popularized motoring and widened the use of the automobile.

SAMUEL POMEROY COLT

Samuel Pomeroy Colt, head of the United States Rubber Company, was appointed receiver for the Bristol (R. I.) Rubber Company in 1887. Colt was a lawyer and had specialized in industrial finance. He knew next to nothing about the rubber business at that time, but he was a master of the theory of scientific business. He applied his knowledge of other activities to the rubber business and studied the business itself in a peculiarly thorough way. The result was astonishing for the Bristol Rubber Company, which had been considered hopeless, showed a material profit from operation under his direction the following year. Then he really entered the rubber business by reorganizing the company, settling with the creditors in cash and stock. Colt naturally was president of the revived concern.

From that time until he formed the United States Rubber Company, which now includes some forty or more subsidiaries ranging from vast plantations in Sumatra where the crude rubber is grown, to factory organizations where every kind of rubber product is made, Colt studied and investigated fundamental business methods and applied them.

When the United States Rubber Company began business it made general rubber goods and was in strategic position to take advantage of the demand for automobile tires when that industry grew. Tires now constitute an extremely important part of the total product of the company, but in the course of a short period they will undoubtedly form the chief element, as the market for tires is growing

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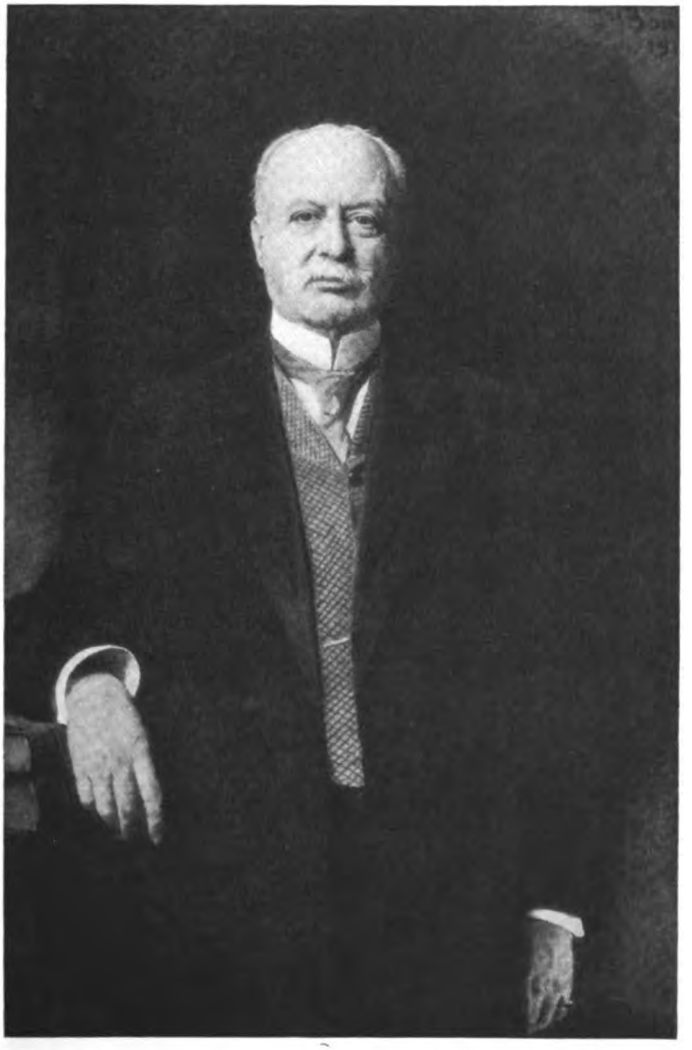

SAMUEL POMEROY COLT
Head of United States Rubber Company.

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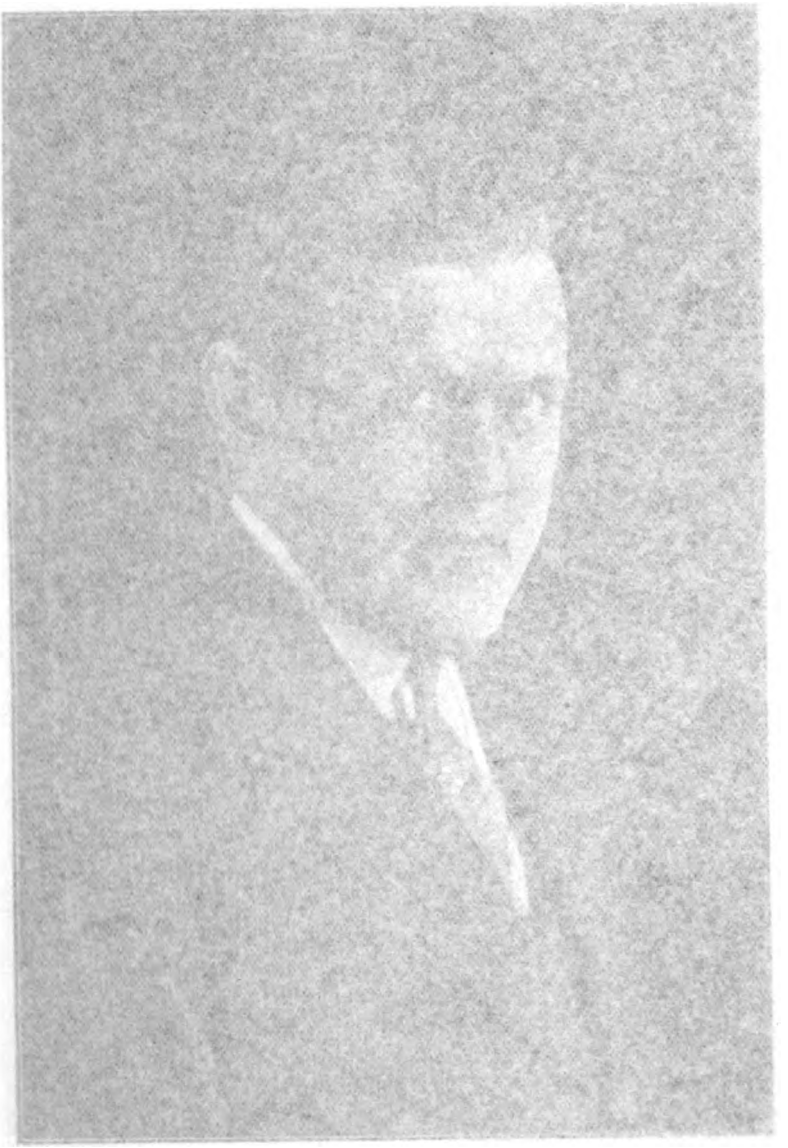

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JAMES NEWTON GUNN
President United States Tire Company.
Expert in Scientific Business Methods.

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by leaps and bounds while that for general rubber goods is only increasing normally.

Colonel Colt has proved to be a potent force in the automobile industry not only because he is the head of a great company that makes tires, but also for the reason that he introduced into the rubber business the economies he learned outside of it.

One of his latest demonstrations of such practice was the engagement of James Newton Gunn, a business specialist, as head of the United States Tire Company. Mr. Gunn was no stranger to the automobile industry, as he had already carved out for himself a niche in the annals of the industry that is entirely unique.

It is doubtful if he knew as much about rubber when called to the presidency of this company as he did about the automobile when he served in the giant Studebaker reorganization. Mr. Gunn is a business specialist head of the firm of Gunn, Richards & Company. He served actively in the Studebaker matter, not only introducing reforms in administration and management, but in the actual conduct of the business. He was head of the Legislative Committee of the N. A. C. of C., and when he had finished his work it is doubtful if there was a better informed person in certain phases of the industry than he.

The tire business passed through several phases, as will be noted in the other articles in this chapter. It had its "hooraw" period the same as the car industry. It had its stage, where the margin of manufacturing profit was large and also small, but finally it settled down to be a sober business of major proportions. It required the service of specialists. As Mr. Gunn is a business specialist and not a rubber man, it is to be assumed that he was chosen to head the company because of the former qualification and not the latter. At any rate, it is a pretty safe prediction that within a short time he will know quite a lot about rubber and its great industry.

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CHAPTER IV

THE ROMANCE OF MANUFACTURING

ATTENDING strictly to its knitting, in the way of perfecting its systems and practice, but occasionally pausing to give Aladdin's lamp a little rub, the American automobile industry took advantage of the two predominant American characteristics, ingeniousness and the love of a good gamble, providing the odds are long enough, to assume such a commanding lead in the manufacturing field that in 1915 it amounts to a practical monopoly.

The manufacture of automobiles in America always had advantages not enjoyed elsewhere. It had raw materials; it had wide distances; it had fuel for both factory and car in abundance, and it had Yankee brains and money.

According to the initial issue of *Horseless Age,* the first of the motor publications in this country, in the fall of 1895, there were some 300 concerns engaged in making automobiles or their parts and accessories in the United States at that time. But aside from the experimental cars of Duryea, Haynes and Ford, there was none running in this country.

Twenty years later there were 319 distinct makes of passenger automobiles running in the United States, and the industry ranked first in the country so far as the manufacture of a single type of merchandise was concerned, with an output of over $1,000,000,000 annually.

From nothing to over a billion a year in a space of twenty years is the measure of the commercial accomplishments of the automobile industry. Nothing like that has ever happened before since man was a cave-dweller, and the end is not yet.

The day of railroad building is definitely done. Like the wagon roads of 1840, the railways are now at a point where it is uneconomic to extend them on the scale that was established twenty years ago, and consequently they will never again present the investment and speculative qualities that attracted the public to their securities, as they have in times past. Not that a single mile of existing railroad

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should be abandoned, where it is in use, for there is a distinct service that the railroads can perform for many years to come.

It is cheaper to build good roads than railroads, and every time the system of good roads is extended the railroad enjoys increased traffic by reason of the production of new and profitable freight to be carried over its lines, and the key to the whole situation is the improved facilities for hauling freight to the shipping points.

The influence that must weigh the scales in the direction indicated is to be found in the fact that the average railroad, at a very low estimate, supports capital issues of at least $50,000 per mile, mostly bonds, while the cost of excellent highway construction is $20,000 per mile. Therefore, while the extension of the good roads systems will add to the value of railroad traffic to such an extent that some far-sighted financiers can see Erie Common paying dividends in the future, there is no justification for building more railroads.

The things that have co-operated to make possible the vast American automobile business are chiefly four. First, the country; second, the material; third, the men, and, fourth, the money. Each factor, useless in itself, has found its complement in the others, and the result is the American automobile, the most important work of man's brain and hands.

And the secret of our supremacy is founded upon the fact that such men as Henry Ford, John N. Willys, Walter E. Flanders, Charles W. Nash, Henry B. Joy, Henry M. Leland, Henry M. Jewett, Charles Clifton, Windsor T. White and a dozen more of the manufacturing giants of the automobile industry have adopted a pace not designed to keep step with the course of progress, but to anticipate the probable trend of events. They have not been in the dark, as the public has, about the importance of the automobile. They have grasped the fact that the automobile is transportation and that transportation cannot be denied.

The brilliant success of the automobile industry in America rests first on America. Its potential and actual wealth, its vast distances and its undeveloped state, were the groundwork that existed for some tremendous improvement in the art of transportation.

The iron, metals, petroleum, coal and other elements of manufacture were here as they were nowhere else on earth.

Man is keener and more self-reliant in a new land than in an old, particularly under such conditions and circumstances as would tend

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to develop the best talent and ability that is in him. And so, when any of the great manufacturers need a million-dollar improvement to save 75 cents per unit in the making, there is no difficulty encountered in getting the money. There have been times, in the not very dim past, when the leaders of the automobile industry met with obstacles in securing finance. At a still earlier date it was almost impossible to find the money for building factories, or financing the operations of manufacture and sale. To-day, however, it is quite different, and there is no reason why any legitimate requirement of a standard automobile manufacturer should go unsatisfied.

The automobile manufacturing art, beyond any question, is the most marvelous development mankind has made in the fabrication of materials.

The foundry work, the drop-forgings, the special processes, the gear-cutting, the making of tires and the distillation of fuels are all wonderful, but the thing that has made them more wonderful in America than anywhere else is the application of minute and detailed scientific methods to increase outputs and decrease costs.

The eminence of the American automobile resulted from scientific manufacturing. The application of the principles of standardization has all but eliminated the necessity for long, hard road tests, such as were an important part of automobile manufacture until 1910. Where all the parts of a car are made of tested and carefully inspected material to measurements, in the following of which only the most minute variations are allowed, and particularly where the production is large and the price per unit low, a block test of the motor and a short run after assembly are all that are necessary.

In the making of larger and more expensive units, thorough tests are made, but with every step forward in the perfection of detail, the necessity for them becomes more and more perfunctory. Theoretically, it is not any more urgent to give a car a gruelling road test than it would be to run an Ingersoll watch for a week before shipping it to a distributing agent. If the parts are made as planned and the assembly is properly done under the eye of inspectors, and if the car will run and there are no apparent defects, there is no reason for a hard practice test.

In the early days of the industry a good part of the automobile was made, literally by hand. To-day a paint-brush and a pair of spanners and the labor they perform, is about the limit of the hand

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work. Precision power tools are superior to human senses in modern manufacturing, nowhere better exemplified than in the making of automobiles.

Factory methods devised and put into effect in the American industry are the admiration of the world, and the perfected plan for assembling automobiles in any of the establishments where the idea of quantity production has been worked out satisfactorily, is probably as good an illustration of the efficiency of the American automobile plant as any other example that can be taken.

Such examples are to be found in the Ford, Studebaker, Maxwell, Overland, Buick and several other factories that have specialized the idea of quantity production to the point where it may be called a fine art. To show how this process has been perfected, the Ford experience is illuminating:

In 1912 it required fourteen hours' labor by one man, which, of course, means the division of that time among many men, to assemble one car. In 1913 the time of assembly had been reduced to an average of nine hours, and in 1914 the average had been lowered to two hours per car assembly, with a record run of 84 minutes.

In this plant there are several assembly tracks, which in fact are slow moving endless belts for part of their distance. Meeting these runways are other belts or carriers, overhead or otherwise, that bring to the main assembly channel certain units ready for installation. The main runway is lined with gangs and teams of assemblers, the duty of each man being to perform some one operation on the car that is in course of building. The axle unit in assembly is started along the belt by one crew. As it passes, the wheels, frames, braces, running gears, shafts, gearset, radiator, muffler, motor, steering mechanism and other units and parts are placed in position and fastened. The car is pushed along on its wheels from the end of the belt carrier until the body slides into position and the job is finished. It is by the use of such a system that 2,000 cars per working day can be turned out.

The elaborateness of the system can be realized when one comes to think that if the supply of a certain size of screw or lock-washer should happen to become exhausted, the whole activity of assembly would cease then and there, but in all the companies of large scientific production there are departments specially charged with the duty of seeing that all parts and materials required in assembly shall be ready when needed, and no excuses are given or accepted for failure

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to have on hand supplies sufficient to keep the current of cars moving.

Using the Ford practice again as an example, it can be seen that the difference between fourteen hours and two hours in the assembly of a unit means a material economy in the cost of production. On the present Ford basis of wages, the cost of assembling a car in 1912 would have been $8.75. In 1914—and it is doubtful if there has been much improvement since—the cost was $1.25.

With the improved forms of high-power tools, the machining of a cylinder casting consisting of twenty-eight operations, takes 45 minutes; the machining of a fly-wheel only a brief moment and other elaborate processes, a proportionately small expenditure of time. Compared with the best foreign practice, the time used in American practice is less on every process, and the sum total of these savings of time represents many dollars in the cost of each unit.

So far as manufacturing is concerned, the American car has so much more sheer quality per dollar of its selling price than any other the world has produced, that the reason for American motor car supremacy in the competitive markets of the world is not surprising at all. While this general truth is more thoroughly advertised with regard to the types of low price, it is equally true in the medium class field and with regard to the cars of top price, made in this country.

From the bottom of the price list to the top, dollar for dollar, the American cars have more value than others, and that is the reason why they find market wherever they are introduced.

Good sound theory—a much maligned factor in any element of progress, by the way—extensive practical experience, and scientific manufacture are the things that put the extra dollar, or hundred dollars, or thousand dollars, as the case may be, into the American automobile's quality and service.

From the early days of the industry until after the financial spasm of 1907, it was quite the fashion for certain types of financiers to bemoan the growing automobile vogue, saying that the American people were headed for financial perdition because they preferred to spend their money for motor cars rather than to invest it in the usual ways that had obtained in the past.

It was quite an embarrassment for the financiers and undoubtedly many meritorious projects that were in their hands for financing failed of a hearty reception by the public because the public preferred to ride in its automobile than to invest its funds in the securities. On

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the other hand, the automobile nearly caused the death of some of the most flagrant swindling schemes this country ever knew. As between the ownership and upkeep of a car and the ownership of certain gaudy stock-certificates representing "blue-sky" in many instances, the public chose the car. It was tough for the "blue-sky" industry, but it represented a simple phase of the law of supply and demand. There was an oversupply of blue-sky issues that were unmarketable because the available demand had been diverted to car ownership.

In making their protest over the condition, the "blue-sky" merchants were for once at least, in respectable company, for their shrill cries of distress were re-echoed by many conservative bankers and financiers, who were moved by the reports of dwindling deposits in the banks, by the filing of numerous mortgages, indicating that the public wanted a car so badly that it would go in debt to get it, but chiefly were the financiers worried because of the danger that the American public would neglect its business on account of the spread of "motorism."

As events have developed, there is excellent reason for doubting the soundness of the position assumed by the financiers in 1907-08 and afterward to some extent.

It was said that money spent upon automobiles was economic waste, because it not only diverted capital from its regular channels, but also provided a means for wasting time.

One illustration will be sufficient to show that instead of being an economic waste, the automobile has created enough wealth to balance every dollar that has been expended upon its production and sale; every dollar that has been spent on good roads for twenty years; every dollar that has been spent for operation and maintenance and has left to its credit a fund, from just one item of value created, sufficient to take care of all thinkable automobile expenses for ten years to come.

It must be admitted by any fair-minded person that the automobile industry stands first on the list of human activities that have been developed in the past twenty years. The simple fact cited before in this article that as a commercial force it has risen from nothing to more than a billion dollars' business a year, which, of course, is away and beyond anything else that has been introduced in the past twenty years in the manufacturing field.

As a matter of statistics and plain fact, the world of twenty years

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ago had every important thing that it has to-day except the automobile.

Twenty years ago land available for residence by persons whose interests demanded their presence in cities had to be located either directly within those cities or close to them on lines of transportation. The residential property had to be within a small radius of the place reached by the transportation line. Outside those very limited zones, all property was unavailable for the residence of the city man.

In a still broader view of the situation, the person who had interests that demanded his presence in smaller cities and in towns could not live very far distant from his work, business or interests, and therefore the great bulk of all land, even that adjacent to the cities and towns, was unavailable for residential purposes.

Nothing has been added to the possessions of mankind in twenty years to change this situation—except the automobile. And it has changed it, radically and profoundly. Taking the situation in and about the metropolitan district of New York, it is found that Long Island is built up for nearly half its length. New Jersey, from Long Branch to Morristown and from Suffern to Jersey City, is a part of the metropolitan district. Westchester County, on the north, is thickly dotted with fine residences, and Connecticut as far as Stamford and Greenwich and even beyond, is a residential section for families whose interests—business, social and financial—are centered in New York.

In Chicago the case is equally true, with its dozens of fashionable colonies and its hundreds of outlying subdivisions and realty improvements outside the zone of regular transportation. In Philadelphia the same fact obtains, and so it is throughout the country. San Francisco and Boston both have felt its influence, which may be tersely described as the concrete and general demand of mankind to enjoy the natural country without giving up his interests in the city. And he has been able to gratify that desire, not through railroads, trolley lines and steamboats, except as they form a good foundation to make the movement broader and more comprehensive, but through the automobile.

Rocky hilltops in Connecticut that were held in such little esteem by their owners of twenty years ago that they frequently forgot to pay taxes on them, even when they were in possession of the few dollars necessary for that purpose, have sold for $1,500 an acre and could not be rebought from present owners for a handsome advance over

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that level. The rocks are just as unproductive as they were in 1895; the roads are just as long and in some cases just as bad as they were. In fact, the actual productive value of the land has not been changed in the smallest particular, in most cases, but the land is much more valuable. The following figures show actual valuations of land in 1890 compared with 1914. The difference between the totals of 1904 and 1912 represents what the automobile has added to land values in eight years. It was carefully compiled from authoritative figures and speaks distinctly.

Taking the figures given for the actual valuation of real estate in the United States in the official census of 1890, it is found that the land of this country was worth at that time $35,711,091,197. There were no automobiles and no good roads, in an automobile sense, in the country.

In 1900 the valuation of real estate, according to the government figures, was $46,324,839,234, and there were still no automobiles nor good roads. The difference between the figures of 1890 and 1900 is $10,613,748,037, or an average of a little over one billion dollars a year. The normal rate of increase of real estate may thus be estimated in rough fashion at about that figure.

The automobile had nothing important to do with the valuation of real estate during that decade. It added nothing material to the value of the land, because there were so few automobiles running that they could have had no special influence.

During the first few years of the present century the cars began to run regularly and steadily, but their real importance was not reflected in the values of real estate until about midway of the first decade. In 1904 the government figures show that the valuation of land was $55,510,228,057, an increase of over nine billion dollars in four years. And the census of 1910 shows a total real estate valuation of $62,341,632,204, or a trifle over sixteen billions more than 1900. If the normal rate of increase had been maintained in the first decade in which the automobile made its commercial entry, real estate valuations would have been about five billions less than the figures show. But the actual figures show that the increase did occur, and occur despite the fact that the panic of 1907 upset relative values as nothing ever had in the history of this country. There must have been a good reason for the increase, and the student of economics will have much difficulty in accounting for it on any other basis than the introduction

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of the automobile. Outlying land became more valuable; farm land increased in value from an average of $15.57 per acre in 1900 to an average of $32.40 in 1910. The acres under cultivation increased about 5 per cent.

But the real test as to whether the automobile is the main factor in the advance of real estate valuation would be found in the totals for the ten years following the general use of the car, say from 1904 to 1914. Unfortunately, the exact figures for 1914 are not available from the government of the United States, but the census figures of 1904 are definite and conclusive as a basis, and they were $55,510,228,057, and the latest complete figures of the government on land values are for 1912. They show a total of $98,362,813,569. This shows that land has risen in value in the eight years between 1904 and 1912 forty-three billion dollars. An effort was made to learn the status of land values in 1914 and official figures compiled by state comptrollers, state treasurers and other state officers, covering the whole country, give a total figure of $114,612,341,510. This total is based on assessed valuations, while the government figures indicating actual values are always considerably higher. For instance, in the state of Illinois the government figures are supposed to cover the full cash value of all lands and the assessed valuations for purposes of state taxation are reckoned at about one-third of the cash value. It is quite likely that the government census of 1914 will show 120 billion, perhaps more, but for the purposes of this article we will reckon only on the full census figures of the United States and will take the totals of 1904 and 1912.

On that basis there has been an increase of over forty-three billion dollars in eight years. If the normal rate of increase is eleven billions in ten years, there is still a margin of thirty-five billions over and above the normal rate of increase, or 4⅜ billions per year.

Thirty-five billion dollars would pay every cent spent experimentally; every cent spent in effective and ineffective manufacturing of automobiles; every cent paid for automobiles by the public; every cent for running and maintenance expenses; every cent for good roads, and still leave enough of a balance to retire the national debt and build a system of roads better than the wildest enthusiast has dreamed of; pay every expense of motoring for ten years to come, and after all that equip an army and navy superior in size, numbers and efficiency to anything of the kind the world has ever seen.

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An economic drain! *Not much.* The automobile has been the greatest factor in the production of wealth since man came out of his caves. And in all the foregoing, no credit has been given to the car for increasing the acreage in productive use and as the greatest force that has gone to make the crops of 1913, 1914 and 1915 the most splendidly progressive development of fifty centuries.

Far from taking a dollar from the resources of the country, the automobile has added fifty billions to our treasure, and its work is only just begun.

The official figures in tabular form follow:

Year.	Total Real Estate Valuations, U. S. Census Figures.
1890	$35,711,091,197
1900	46,324,839,234
1904	55,510,228,057
1910	62,341,632,204
1912	98,362,813,569
1914	*114,612,341,510

The added wealth due to the automobile would counterbalance the following items:

Money spent for good roads between 1900 and 1915	$2,500,000,000
Money spent for automobile production	5,000,000,000
Money spent for automobiles	3,000,000,000
Money spent for maintenance and operation	5,000,000,000
For a system of highways ten times better than any contemplated in the hopes of good roads enthusiasts	10,000,000,000
For a Navy	10,000,000,000
For an Army	10,000,000,000

Leaving a balance big enough to wipe out the national and most of the state bonded debts, while the most insignificant increase in valuations annually over normal would provide for the cost of operation, not of 3,500,000 cars now in being or scheduled, but 10,000,000 automobiles.

Talk of the economic drain caused by the automobile? Nonsense!!

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*The figures for 1914 are compiled from other sources than the Federal reports and are estimated to be too small by at least $6,000,000,000.

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STANDARDIZATION: PLUS SPECIAL STEEL: EQUALS QUANTITY PRODUCTION

Great strength and high quality are required from all the materials entering into the manufacture of the automobile. The car is no stronger than its weakest element, and consequently all must possess approximately equal strength for the duty to be performed.

Specially and properly heat-treated alloy steels have worked a revolution in the automobile industry. It used to be that cold-rolled and high carbon steels were about all that entered into automobile building, but the widely diversified service demanded of various parts of the car proved that something better and stronger was required in certain parts, so that the automobile as a whole could continue to deliver the service for which it was intended.

The addition of tungsten to the steel designed for valves, the specification of chromium for springs and vanadium for purity gradually operated to lighten the total weight of the car.

It is quite manifest that if 800 pounds of steel were used in the manufacture of a car capable of delivering a certain degree of service, and if by the addition of alloys and special heat treatment the same or better service could be obtained from the use of 600 pounds of steel, the motor would not have to be so large in order to produce the same quantity and quality of service. A small difference in the size of a motor runs into weight very rapidly, and the lessening of weight means that smaller tires could be used. The smaller motor and smaller tires cut down operative expenses.

While the first cost of an automobile is a very important item, it is not nearly so important to the user as the cost of operation and maintenance. But the initial saving of 200 pounds of extra weight in steel, the smaller motor and lighter axles, frames and running gear, the smaller tires and lesser operating costs, also make for a reduction in the initial cost of the machine.

The main effect of the introduction of alloy steel into the American automobile of low price in the way of merchandising has been to extend the sales field into financial territory that would have been unavailable without it. There are vastly more people who are able to spend $750 for a car and $500 a year to operate it than there are persons able to spend $1,000 for a car and $800 a year for operation.

Alloy steel, specially and properly heat-treated for the service it

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is designed to perform and used in quantity production of automobiles, has undoubtedly had the effect of reducing the selling prices of automobiles, reducing their operating expenses and consequently enlarging the possible field for their distribution, besides adding to the quality of the car by strengthening it symmetrically.

From the earliest period of the American automobile industry some slight use was made of special steel for special purposes. Heat-treatment is nothing recent in automobile practice, but the early cars did not have to bear the same degree of stress that modern automobiles are called upon to withstand to-day, as a matter of course.

But the European manufacturers had a long start and the steel they put into the cars corresponding in point of time with the early cars of Winton, Haynes and Olds was very different from that used by the American makers. In fact, the demand for alloy steels for automobile making was not at all important prior to 1907, long after the industry was established and the output of it led the world in volume.

Nickel steel, one of the commonest of specification metals was used very little in automobile making up to that time and it is recounted that the special steel company that made it a point to be able to supply unusual types and kinds of steel had a stock of 10 tons of nickel-steel in its warehouse without a call for over a year.

The important fact about the whole matter is that the difference between the materials used in the best foreign cars and the material used in American manufacture was discovered and fully recognized about 1907 and importations of Krupp steel, betterments in American methods and the invention of new formulae took place rapidly.

In modern automobile making there is scarcely a single line of manufacture that does not utilize anywhere from one to ten or a dozen different kinds of steel and from two to five or six processes of heat-treatment.

The result has been that distinct progress has been made, not only in the direction of lightening the car, as outlined above, but toward the ideal condition where the automobile will approximate the Deacon's "One-Hoss Shay" of song and story—each part being equally strong and equally durable.

Special steels for special purposes; standardization and quantity production are three factors in American automobile supremacy. They are all interlocked and associated in such a way as to make their separa-

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JOHN W. BATE

Vice-President Mitchell-Lewis Motor Company. First engineer to build one hundred identical cars.

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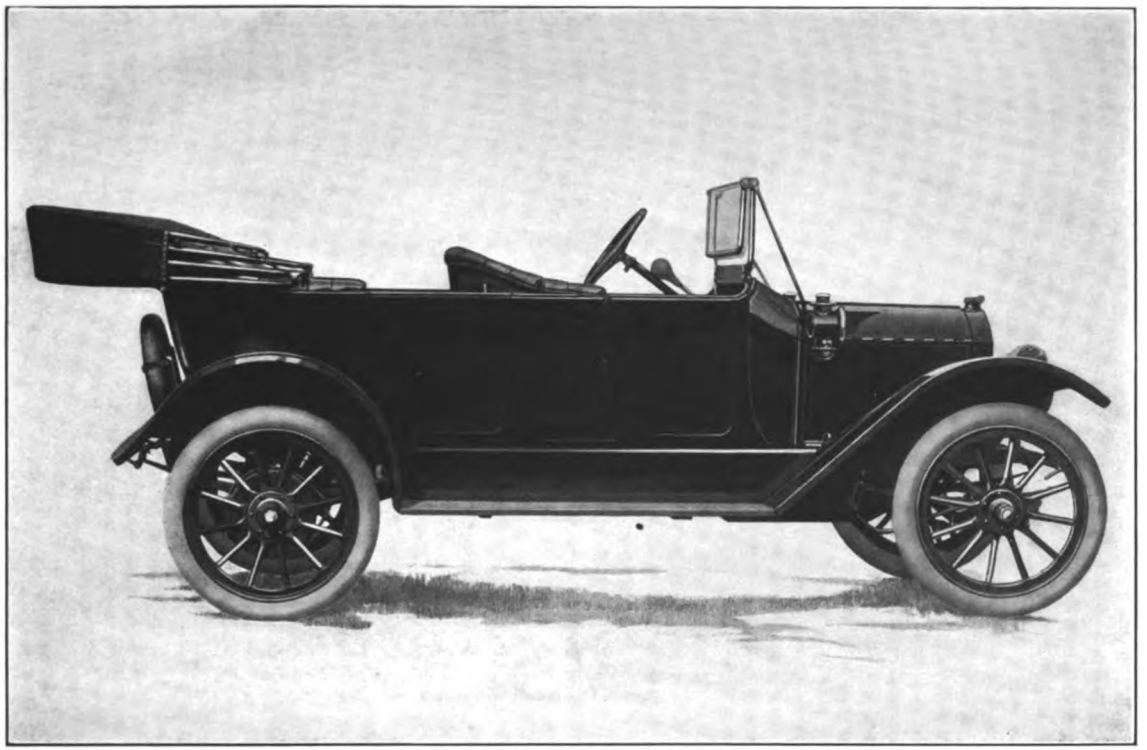

THE MAXWELL OF 1916. AN EXAMPLE OF QUANTITY PRODUCTION

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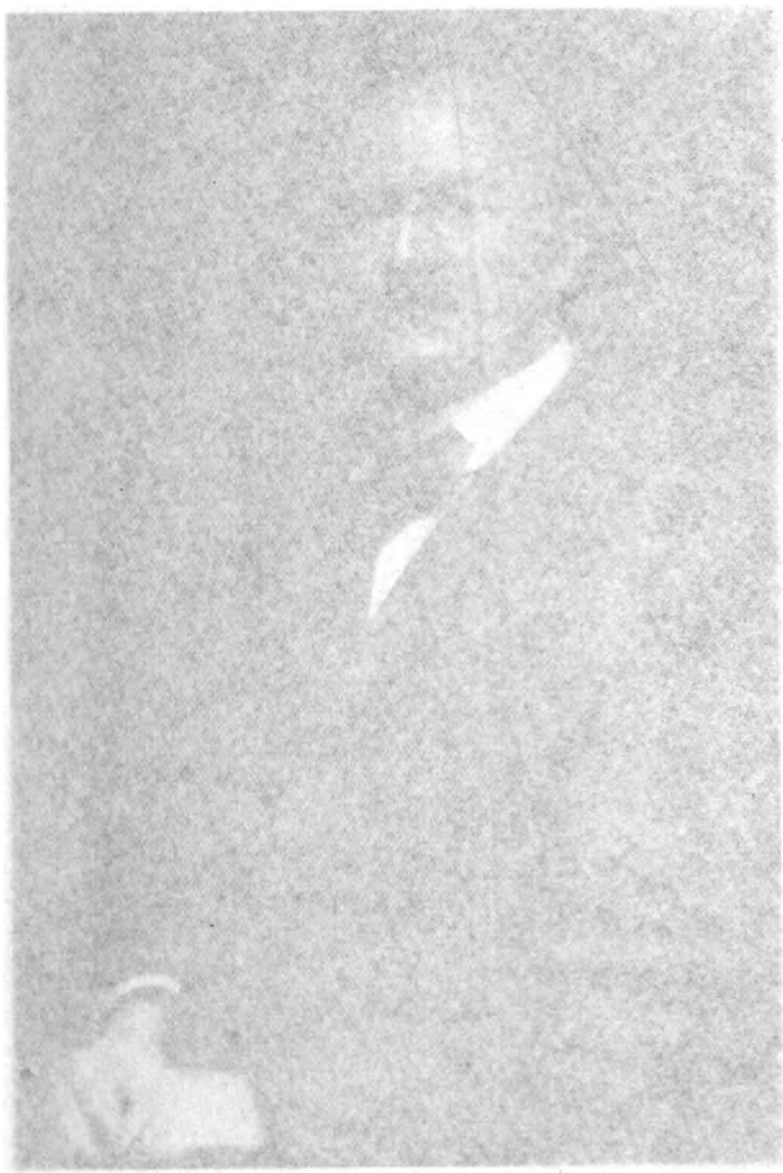

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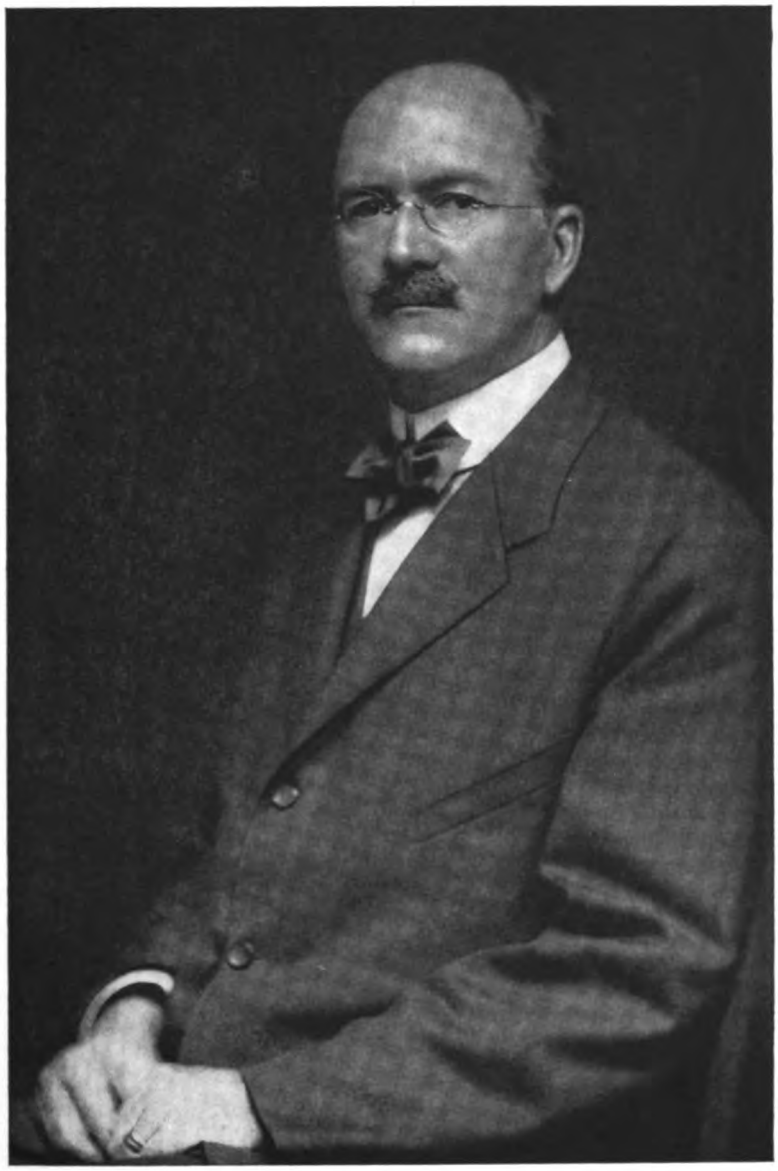

HENRY SOUTHER

Former President of the Society of Automobile Engineers. One of the leading steel experts of the world.

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tion impossible. In attaining the results that have been accomplished, each depends on the others. The subject of standardization has been treated at some length in another chapter and examples of the effect of quantity production have been given in several places in this work.

Quantity production would bankrupt any industry unless there was a market for the output. The product must be of high service and fair price. Special steels for special purposes supply the quality of high service and standardization by eliminating waste makes it possible to sell the product profitably in competitive markets.

Of course, the whole idea must be based upon skilful engineering and ingenious design; upon good administration and clever selling, as fundamental principles.

John W. Bate, vice-president of the Mitchell-Lewis Motor Car Co. of Racine, Wis., was the first engineer to essay quantity production of automobiles.

He commenced his experimenting before 1895, as an engineer employed by the Western Wheel Works and developed an air-cooled motor designed for use in light road work in bicycles and tricycles.

After two years he abandoned the first idea and began work on a light four-wheeled car. A few of these were produced, but about 1898 the company made a contract to build 500 three-wheeled machines for the European market, to be delivered on short notice.

Bate and his associates filled the contract and delivered the cars, which were known at that period as "Tri-Motos," two-passenger tricycles with motor mounted on the front wheel.

Until quite recently, a few survivors of the cars made by Bate in 1898 and shipped across the Atlantic in the following year, were to be seen on the roads of rural England. Perhaps one or two are still running, for Bate made a thorough job of the first "quantity production" order ever given.

He had to adapt existing machine tool equipment. He had to make jigs, dies and templates. He had to supervise the quality and quantity of materials in a different way from modern practice. That he succeeded at that early period in producing as good results as he did, is a rather astonishing fact.

Bate in 1916 is recognized as one of the potent forces of the industry, and, while the development of his present product is a brilliant and significant achievement, the filling of the pioneer order for

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quantity production stands out as one of the notable events of the automobile industry.

Ransom E. Olds and Alexander Winton also produced large quantities of cars in the early years of the industry, but the career of Walter E. Flanders marked the development of quantity production on its present gigantic scale.

There are many other manufacturers who have played important parts in the industry in this particular. The services of Thomas, Chalmers, Joy, Coffin, Dodge, Drake, Ford, White and dozens of others have made indelible imprint on its progress, but Flanders was the man who first built 10,000 cars in one year, that year being 1908.

WALTER E. FLANDERS

Back in the days when automobiles were emerging from their horseless carriage swaddling clothes, a big placid man with an unruly mop of curls handed a card to the front door guardian of the Ford Motor Company, then located at Piquette and Beaubien Streets.

"Give this to Mr. Ford," the big man rumbled in deep chest tones.

There was something compelling about his manner and the messenger was speedily on his way to Mr. Ford's office.

"W. E. Flanders," read Henry Ford, as he glanced at the card. "Who's he, I wonder?" And then his eyes caught the one word written in the corner of the card. "Crankshafts," commented the manufacturer. "We will see if this Walter E. Flanders can help us out of our troubles in the crankshaft situation. We will regard him as a sort of second Moses, and time spent in getting him lined up for any such purpose as that will be worth while. Bring Mr. Flanders up."

With characteristic brevity, Flanders explained to Ford that he believed he commanded an organization able to furnish the Ford Motor Company with regular deliveries of crankshafts—a deal which the whole manufacturing world knew was at that time causing great anxiety at the Ford plant.

"How are you going to manage it?" asked Ford.

"Well," Flanders replied, "I know machine tools, and there are some boys down in Ohio who will take their shirts off for me in getting this job out."

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Flanders left the Ford office with an order for 1,000 crankshafts in his pocket and a promise of more in case the schedule of delivery agreed on at the conference was maintained.

Back to the little town in Ohio, the village machine shop whence he had come, Flanders wended his way. En route he laid out the tools and equipment necessary for the forging and grinding operations incident to the new contract. Money was not plentiful with Flanders, but the Ford contract and his own reputation among machine tool men served as satisfactory credit. The boys, who Flanders remarked would take off their shirts for him, fell to with all the enthusiasm Flanders had predicted. The village machine shop made good. Ford crankshafts came through on schedule and the increased orders contingent on performance were duly given.

It was during the period covered by this business relation that Henry Ford first saw himself within reach of a fulfillment of his great manufacturing ambition—the production of 10,000 motor cars within a year.

Ford was thoroughly convinced that the sale of these cars would be an easy matter providing production could be guaranteed. His chief bug-a-boo was the lack of organization in the firms to which he was compelled to look for material and units not built within the limits of the Ford plant. Floor space in the Ford factory was itself at a premium, and no manufacturing strategist in the Ford organization had yet succeeded in planning a production scheme which would keep material coming in a stream and obviate the confusion which caused so much wasted time in each working day.

Ford was also convinced that the automobile industry offered a wonderful opportunity to some man who could furnish it with the original mechanical equipment so necessary to the success of any production plant on a large scale. Building automobiles was far from an exact science. Ford could see plainly that a production man who could bring order out of machine tool chaos would be able to greatly increase and probably double the output of his plant.

In this emergency he thought of the big man with the mop of curly hair, who, when all others had failed, delivered on regular schedule crankshafts enough to take care of the Ford output—delivering them not from a great and well-equipped plant, but from a machine shop in a small town and only equipped in the greatest haste.

Ford wired to Flanders and a conference followed, resulting in

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Flanders accepting the position of production manager at the Ford plant. Ford gave his new executive powers of the broadest type, making him superior in fact to every department head of the Ford organization, and placing him in a position where he could command co-operation as he wanted it.

In addition to the salary paid Flanders he was to receive at the end of the year a bonus of $20,000 in case he could so organize the Ford plant as to produce 10,000 motor cars.

Flanders sent to Ohio for his right-hand man in the crankshaft business, Thomas S. Walburn. With Walburn he began and completed a thorough rearrangement of the Ford plant. Flanders had himself been a manufacturer and salesman of machine tools. For some time he had been working out plans by which conventional metal working machinery not already adapted to automobile manufacture could be made acceptable outright, or with minor alterations. Flanders knew where such machinery could be purchased for immediate delivery. A month was spent in the rearrangement of the Ford plant and the installation of the new machine tools, when operations began, Flanders paying especial attention to the machine tools and the supply of material; Walburn hiring and firing and driving the Ford production organization with a grim enthusiasm so impressive as to make lethargy impossible anywhere in his jurisdiction.

It was a matter of weeks before the Flanders machine really began grinding out Fords at the anticipated rate, but the executive of the organization had laid his plans with an eye to the financial result only.

The third month of the Flanders' regime saw a production of 1,000 cars and insured the attainment of the desired maximum within a year, barring accidents or unforeseen events.

Flanders and Walburn were tireless and were always at their posts, before the arrival of the humblest workman. Darkness found them still at the plant.

The last three months of the production year Flanders spent almost exclusively in making sure that sufficient stock and material would be available for the completion of the assigned production maximum. So terrifically did he pound producers of parts that, during the closing weeks of the year, material was stacked up in the open in the factory yard, while all the warehouse room within many blocks of the factory, as well as empty barns and even empty houses were jammed with stock for Ford automobiles.

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There has always been a rumor about Detroit that the Ford organization itself was not especially anxious that Flanders should complete the last 200 or 300 automobiles of the assigned 10,000. Whether this report was well founded cannot be told. However, two days before the year was out the ten thousandth Ford rolled from the factory into a freight car, and Flanders had earned his bonus.

Soon after the end of that year Flanders resigned at the Ford organization. It had served his purposes. It had given him the chance to show his ability as a manufacturer and his knowledge of machine tools—had done it in a way which had given the information to every person connected with the automobile industry.

B. F. Everitt, who in a way should be counted as another graduate of the Olds school, he having been engaged for years in supplying equipment of certain kinds for the Olds product, and William E. Metzger, one of the pioneers of the automobile industry, joined with Flanders in forming the Everitt-Metzger-Flanders Company shortly after Flanders's resignation from the Ford organization became effective.

Metzger was a salesman of marvelous ability and knew all there was to be known at that period about marketing. He had been one of the founders of the concern that built the Northern and owned one-quarter of its stock at the time he joined Flanders.

Metzger's most spectacular action during his connection with the automobile industry was his success in selling 2,700 Cadillac cars at the New York Automobile Show of 1903, before the Cadillac car was known at all, and actually before three cars had been built. Of course, Metzger's feat looks pale beside the sale of $22,000,000 of Chalmers cars in forty minutes November, 1915, but it should be remembered that there was an important difference in time and the development of the industry between 1903 and 1915.

Everitt and Metzger had money and could get more, and Flanders had the production experience.

This was the chance for which Flanders had been long hoping, the chance which had led him to enter the automobile business by the nearest and first offered door. In the "tooling-up" of the E-M-F plant he made use of many types of machine tools then new to the automobile business.

The E-M-F-30, by which name the product of the triangular alliance was known to the trade and the public, was to be throughout

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a "jig job." In other words, each part on which a mechanical operation was to be performed was brought to that operation tightly clamped into a certain frame which corresponded in its dimensions to the base of the tool which was to perform the operation.

The result of this sort of equipment was accuracy and uniformity of product. For this accuracy Flanders was not relying on the human element, but was going far back of the returns to a system which would make it impossible for any tool to err.

In addition to the wide variety of jigs used to hold the various parts of the E-M-F Company product, Flanders arranged some unusually versatile types of specialized machinery. Among these machines were millers which smoothed two or more faces of a casting simultaneously; multiple spindle drills which at one operation drilled a large number of holes in a casting; automatic screw machines, gear cutters and die presses, some of which had been used to a limited degree by parts manufacturers, but few of which had ever been parts of the equipment of any builder of motor cars.

He tooled his new factory solely with the idea of large quantity production, applying to the automobile business the principles in use among the manufacturers of stoves, sewing machines, rifles and similar articles of manufacture in which time had made it possible to develop production to a highly specialized degree.

The first cost of a machine might be great when viewed in an isolated way, but when distributed over a production of 10,000 cars the cost represented but a small amount for each unit of the output. In the meantime, however, it made possible production of one part in a thoroughly efficient way, saved labor cost, and insured a corresponding reduction of the price of the automobile.

A large number of such reductions in manufacturing cost produced a corresponding lowering of sales price.

By lowering the sales price beyond the reach of competition, a demand would surely be established which would keep Flanders and his organization busy the year round to supply.

One set of jigs for a complete automobile cost in the aggregate thousands of dollars, but when you distribute it over a production of 10,000 cars, the jig expense per car is but nominal.

A jig-built automobile when built in quantity would become, Flanders plainly foresaw, an automobile not only cheaper but actually

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better than the rival car built by methods then conventional in the automobile business.

The work of an automatic machine, Flanders knew, must be infinitely superior to the work of human hands assisted by machinery. Only by automatic machinery could a thoroughly standardized automobile be constructed.

As at the Ford plant, he installed Tom Walburn as his right-hand man. Manufacturing operations began smoothly and on time. There were a few details of the plan which needed minor revision before maximum production could be attained. With these details squared away, Flanders and Walburn began to turn out the automobiles rapidly.

Superior cars like this would sell readily, Flanders knew. Sales would keep pace with production, thus justifying every reasonable expenditure for equipment.

Flanders hired the most expert assistants on the market and paid them salaries which established new records in the automobile industry. Where others might hesitate to pay an engineer $20,000 for his year's work, Flanders paid that and more, reasoning that the distribution of this salary over a large output reduced it to only a small per car charge, and, at the same time, insured for each car designing ability of the highest order.

The contracts placed by the Flanders purchasing agent were of staggering size, but the size enabled the E-M-F Co. to buy at rates well below the general market. In more than one instance an order for parts was big enough to cover the whole output of the supplying manufacturer. This was a commanding advantage in securing deliveries, as the manufacturer would be supplying but one client.

As an adjunct to his engineering department, Flanders established a chemical and physical laboratory and put it in charge of the best metallurgist he could hire. This metallurgist paid his way from the start by insuring quality of raw material and freeing Flanders from the grasp of dealers in specialties with reputations more or less justly secured. Often Flanders and his engineers knew more about a material than the firm that produced it.

The directors and moneyed men of the company were thoroughly convinced of the soundness of Flanders's ideas on big quantity production. They showed their readiness to back him in any desired expansion of plants and at his request purchased a large steel bath-tub

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factory on the Detroit River front. This plant Flanders equipped for the production of pressed steel parts for the E-M-F car. It was the first pressed steel factory of anything like its size employed on automobile service only, and represented some highly original ideas of Flanders on the available nature of pressed steel for automobile use.

The lightness of this material and the fact that dies and presses could manufacture it in almost any shape and at a tremendous rate of speed, recommended pressed steel to Flanders for use in many parts of the automobile where castings were then employed. Not only was this plant tooled to the furnishing of fenders, hoods, running boards, tanks, body panels, but it was also tooled up from time to time to produce running board brackets, rear axle housings, control lever brackets, hub caps, radiator caps and a multitude of small parts hitherto the product of either the foundry or the forge.

The E-M-F Company proved a tremendous money-maker. Its growth in size and scope kept pace with its prestige in the sales field. A large forge shop was added to the manufacturing equipment, and a foundry. Before the organization had been two years in operation, it was building virtually every part of its product from the raw material with the exception of electric apparatus, wheels and tires, and a few similar specialties.

A second car—the Flanders-20—was added to the line. It is a noteworthy fact that this car produced in 1910 was equipped with a four-cylinder motor, sliding gear transmission and a five-passenger body at a list price of $750—not so widely different from the price charged for similar cars at the present time.

Early in the history of the E-M-F Company the members of the triumvirate accepted an offer from the Studebaker Brothers of South Bend, Indiana, who desired to purchase the whole E-M-F output. This permitted the E-M-F Company to concentrate all its energies on production—a development in which Mr. Flanders had shown himself so remarkable a genius.

Everitt contented himself with taking care of the financial management of the company. Metzger went on a long trip abroad. The chief responsibility of management and execution devolved consequently on Mr. Flanders's head.

Late in 1909 the Studebakers dropped a bombshell into the E-M-F camp by declaring that they would not be in a position to accept further deliveries of cars. Flanders had never been a salesman of auto-

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WALTER E. FLANDERS

President Maxwell Motor Company. The first man to build 10,000 cars a year. "Father of Quantity Production."

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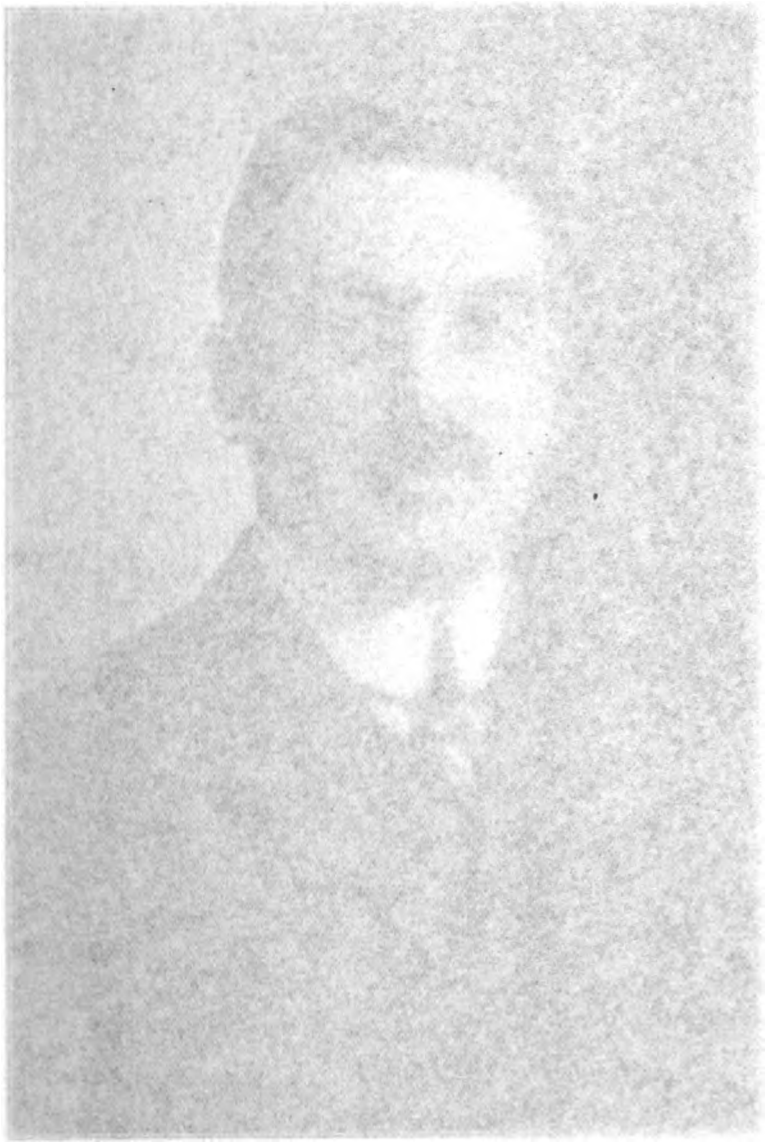

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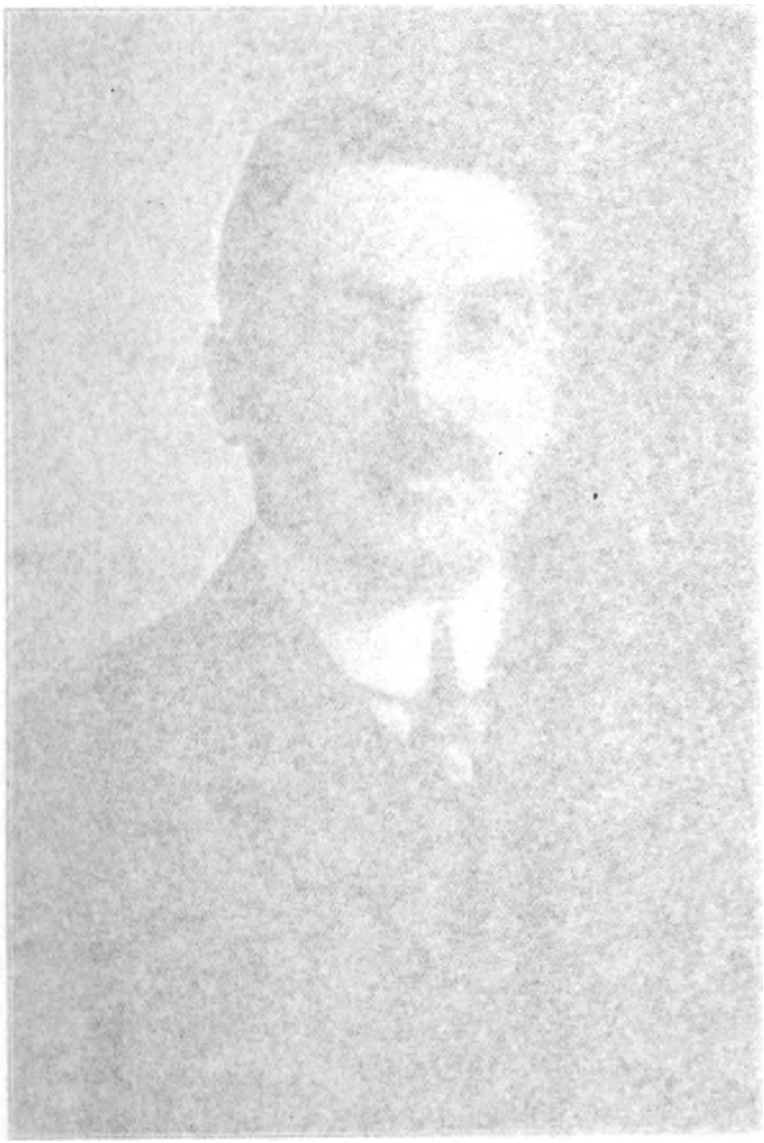

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WILLIAM E. METZGER

He sold the year's output of 2,700 Cadillacs in 1903 at the New York Show before any of the cars had been built.

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mobiles, but his conduct in this crisis stamps him as a sales general of the highest type.

Large advertisements were immediately inserted in newspapers and weekly periodicals appealing to automobile dealers and informing them of the fact that the E-M-F Company line would be handled everywhere direct and no longer through a jobber.

There was an instantaneous response. Incoming trains brought scores of dealers daily who headed direct for the E-M-F Company plant and stood in line waiting for interviews with the sales executives Flanders had placed in charge. Often there were two or more applicants for the same territorial rights. It is said that the San Francisco dealership was sought simultaneously by seven men and combinations, each of which stood ready to post a certified check for deposit amounting to 20 per cent. of the value of the cars covered by the contract which would be given the dealer having jurisdiction over the Pacific Coast.

The Studebakers endeavored to stop this organization of an independent sales staff, and fought the matter in the courts, but Flanders was also well provided with legal talent and in the end won a commanding victory.

A few months after the establishment of this independent sales staff the Studebakers made Flanders and his partners a cash offer for their holdings in the company. It is understood that this offer was at the rate of seven dollars for each dollar of par value stock held by the triumvirate.

Flanders remained for some time as general manager of the Studebaker, but eventually resigned and was content for several months to conduct the affairs of the Flanders Motor Company—a comparatively small concern manufacturing electrics and motor cycles.

Everitt and Metzger, with the proceeds of the sale of their E-M-F Company stock started the Everitt-Metzger Car Company, which later became the Everitt Motor Car Company. They finally asked Flanders to join them, which he did, the name of the concern being changed to the Flanders Motor Company.

This plant Flanders throughout equipped and organized as of yore. He called to his aid many of the men who had stood at his back with the E-M-F Company organization. He found the company, however, was involved in debt as the result of its unsuccessful

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operation during the interim, and that his plans for equipping it with modern machinery were materially hampered.

At this juncture there appeared a new outlet for Flanders' ability as an organizer. This outlet also brought Flanders and his partners a way out of their entanglements. The automobile world had just been startled with the crash which accompanied the collapse of the United States Motors—an organization including manufacturing plants building seven brands of automobiles and containing as well nearly 160 affiliated companies organized for purposes of sales or other functions.

The failure disclosed a tangle so hideously intricate as to baffle even the skilled Wall Street financiers who attempted to unravel it. To reorganize and place on an efficient producing basis the hodgepodge of plants which the old organization maintained in various parts of the country was a task even more difficult.

It was owing to the financial interests which fell heir to the United States Motor fragments that their chief problem lay in finding a man who could weld into one harmonious producing unit the scattered interests of the old organization. They looked the field over and decided on Walter E. Flanders. Flanders, however, refused to leave his friends. He suggested that the reorganization of the United States Motors should also include his own plant and that of his associates. The banks had no especial use for the Flanders properties, but needed Flanders himself. He and his partners were therefore given stock in the Maxwell Motor Company, Incorporated, taking it in exchange for their holdings in the Flanders Company, then of doubtful value.

The reorganization of the United States Motors plants constituted a task well worth the attention of any manufacturing genius. There were plants in five states manufacturing no less than twenty-eight models under seven brands. Flanders announced that these plants must be condensed and that the product of the reorganized company should be confined to one chassis, and that for a car of popular price and of a design featuring lightness and efficiency.

At one sweep Flanders banished from the active list such famous motor car brands as Maxwell-Briscoe, Stoddard-Dayton, Brush Runabout, Columbia-Knight, Courier and Alden-Sampson. It was agreed that the new car should be called the Maxwell. An absolute carte-blanche was given Mr. Flanders for the equipment of his revised manufacturing plant.

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He immediately decided on the abandonment and sale of many of the former United States Motors properties, concentrating manufacturing operations in the Middle West, with general headquarters at Detroit and auxiliary plants at Dayton, Ohio, and Newcastle, Ind., both within easy distance of the main base and in cities where the Maxwell interests could readily dominate the labor market.

The Newcastle plant was reorganized as a 60-hammer forge, in which all forgings for the Maxwell car could be produced. A large section of the plant was also set aside for service purposes, and the announcement was made that the Maxwell Motor Company considered itself morally bound to maintain stocks of parts for all cars to whose plants and machinery it had fallen heir. A great machine shop was fitted up to keep supplies of parts for obsolete models always on hand.

At Dayton Flanders organized a body building plant and a plant for the manufacture of motors and rear axles. In Detroit three manufacturing plants were maintained—the Briscoe plant for the production of radiators and pressed metal parts; the Milwaukee Avenue plant, for engineering purposes and experiment; the Oakland Avenue plant as an assembly center and motor factory.

Though the units of this system were scattered, Flanders welded them into an harmonious, efficient whole. Production began on schedule within a few months of the formation of the new organization and the new Maxwell car proved itself a supreme credit to the Flanders' line of manufacture. In the third year following the organization of the Maxwell Motor Company, Incorporated, the organization reached fourth place in numerical production of automobiles, according to the official figures of the National Automobile Chamber of Commerce—a triumph far greater than anything which had preceded any Flanders experience.

Flanders and his compatriots who had received large quantities of Maxwell stock at an extremely low valuation when the reorganization took place, have profited enormously.

From the start Flanders has been president and controlling executive of the company. Within a few months the duties and title of general manager were added. During the period of Maxwell reconstruction he was not only his own production manager, but was also for a considerable time his own sales and advertising manager.

The rehabilitation of the Maxwell interests is pre-eminently a

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personal triumph for the original apostle of large quantity manufacture. His present contract is for five years and was made January 1, 1913.

HUGH CHALMERS

Scientific business system, carried out in an efficient way, is exemplified in the service Hugh Chalmers has performed for the automobile industry. Not that he is the only business scientist in the industry, for that would be palpably untrue; but he entered the business at a time when such a man was needed and scored a notable success.

Eight years ago if the head of any of the motor car companies then doing business, had been told that it was possible to sell $10,000,000 worth of cars in the space of twenty-four hours, he would have laughed and called the police. Yet on November 17, 1915, at probably the most remarkable sales convention ever held in Detroit, 600 automobile merchants from widely scattered sections of the United States contracted to take $22,000,000 worth of Chalmers automobiles in the short space of forty minutes.

It is a coincidence that the above remarkable record marked the eighth anniversary of Hugh Chalmers' connection with the industry. In the year 1907 Chalmers, then drawing a salary of $72,000 a year as vice-president and general manager of the National Cash Register Company, decided that the automobile industry offered him greater opportunities as a business builder and executive. The E. R. Thomas-Detroit Motor Car Company was casting about for a man of recognized ability as an executive.

A big and insistent demand had sprung up throughout the entire length and breadth of this country for more and better motor cars. The problem at that time was not one of marketing the cars, but related more to efficient production and ability to make deliveries on time. If the city of Detroit, insofar as automobile industry is concerned, ever did resemble a mining camp, it was during that period. Automobile companies with high-sounding names and modest resources were housed in old-fashioned factory buildings, sheds and even tents. Speed was the watchword of the hour. Quality came second, if consulted at all, and hardly any two cars were alike, even though turned out by the same maker. At this unsettled period Chalmers became president

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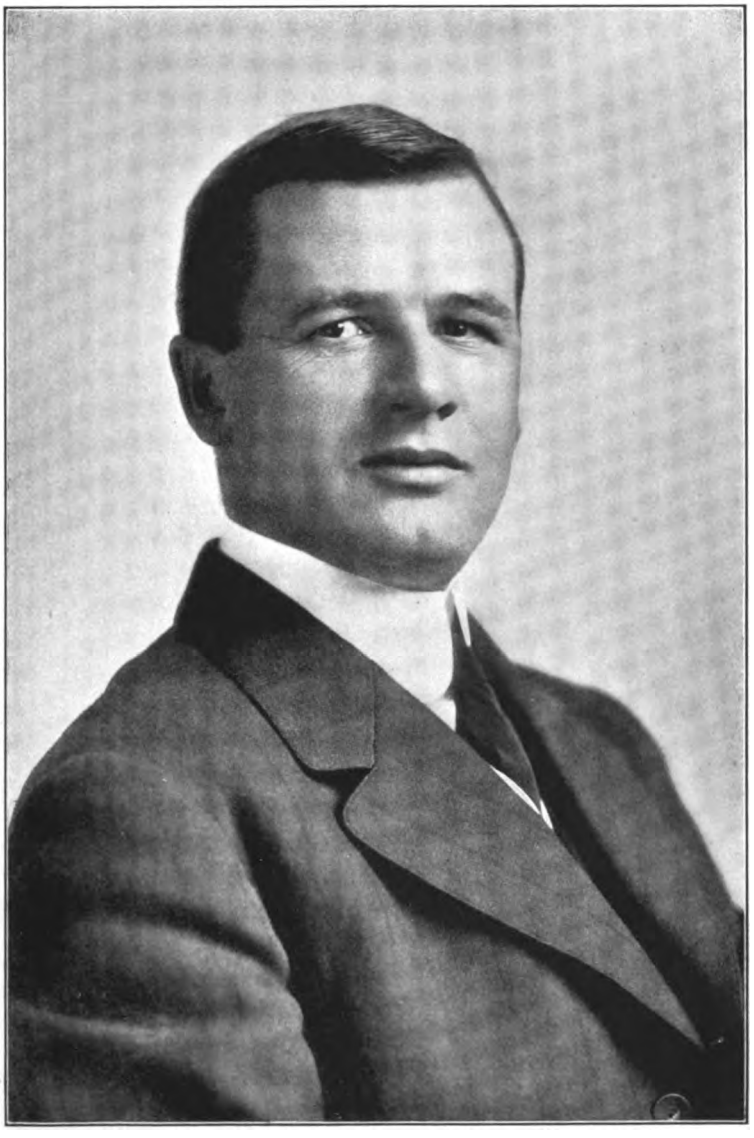

HUGH CHALMERS
President Chalmers Motor Company.
Scientific Business Expert.

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of the Thomas-Detroit Motor Car Company, then turning out a Thomas-Detroit car which sold at $2,750.

Practically from the day he joined the company, he had a single idea in mind, and that idea was to manufacture a high quality automobile to sell at a medium price. Through his efforts the Chalmers Thirty, the first car bearing his name and selling at $1,500, was produced in 1908. The name of the company was changed to the Chalmers-Detroit Motor Company, Mr. Chalmers having purchased a substantial interest in the concern.

At that date, the need for a car of rugged construction, with the ability to stand up under all sorts of abnormal strains, was even more pressing than it is at the present time. Both city pavements and country roads imposed the most gruelling tests on the early products of the motor car factories. The new Chalmers Thirty seemed to meet with the immediate approval of the motor car buying public. The car stood up under all the endurance tests, hill climbs and races in the next two years, winning the much coveted "Glidden" trophy in 1910. It rapidly became one of the most popular cars of its price class. In the same year Chalmers became the controlling factor of the Chalmers Motor Company, and he has enjoyed the unique distinction of having served continuously as president and general manager of the company now bearing his name since he entered the field in 1907.

Under his leadership the plant has grown from a single building to one consisting of twenty-three main buildings, with close to one million square feet of floor space. Practically from the beginning Chalmers opposed the idea of an assembled car. During the past eight years there has seldom been a time when one or more buildings have not been under course of construction on the Chalmers grounds, each building housing two or more manufacturing departments turning out complete parts from the raw material.

Just how well he planned was demonstrated only recently when the European war had been going on for over a year. Automobile concerns that had preferred to take the immediate profits from assembled cars, rather than build ahead for the future, found themselves suddenly confronted with prohibitive prices on some of the finished parts.

Through Chalmers' foresight his factory was in position to manufacture practically every part of the car from raw material. He has been foremost in installing new machinery of the labor-saving type

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and has paid as high as $90,000 for a single machine which stamps out fenders and other portions of the cars.

There are three elements in the success of the great factory: First, the factory is so arranged that efficiency is in evidence everywhere; second, he has an organization that is strong at every point; third, the head of the concern is in every way competent to handle the growing business. Plant, organization and the man! Any business will thrive with these elements in it.

Chalmers's engineers have consistently kept up with the advanced ideas of the times. When the six-cylinder car became definitely established in popular favor, Chalmers engineers were prepared to meet this demand with an efficient car of this type.

Believing that the big question in the future is going to be one of economical operation, the engineers have devoted special attention to the production of six-cylinder motor types with a low cost of upkeep.

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CHAPTER V

THE ROMANCE OF THE ORGANIZATIONS

OF THE many remarkable chapters in the history of the automobile industry, none is more unique and interesting than that of the several national organizations of the motor car manufacturers. It is a fifteen-year romance in which friendship and strife, co-operation, separation and reunion have followed in quick succession.

The associations have exerted a powerful influence in the upbuilding and direction of the industry, have fostered harmony, opposed oppression and created many close personal friendships between keen business competitors. Other industries in which commercial rivalry has engendered bitter enmities have looked with surprise and envy upon the fraternal co-operation among the automobile manufacturers that has accomplished such wonders and asked, "How do you do it?" It seemed to them there must be some powerful secret way by which strong competitors were induced or forced to work in unselfish harmony for the good not only of the members of the associations themselves, but for the industry as a whole.

There is no secret back of the close co-operation in the automobile trade. It is due, partly, to the fact that the manufacturers of cars, engines, tires and other parts and accessories formed an association in the very early days of the new industry, when they needed to stand together in self-defence against unjust and discriminatory legislation and to promote popular interest and confidence in the new method of road locomotion. To an even greater extent it resulted from the fact that the men who initiated and developed the industry were comparatively young men possessed of energy, ambition, high ideals and faith in their fellow men. Their ranks have been augmented as the industry grew by other broad-minded young men, with foresight enough to see that individual success was not opposed to the success of competitors.

"Co-operative competition" is a recently coined phrase that happily expresses the condition prevailing in the industry. The broad-gauge liberality and amiability of the leaders of the industry who direct

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the policy in association matters is shown by the attitude maintained toward manufacturers who are not fellow members. From time to time conventions are held by the association in which all companies in a given branch of the trade are invited to participate, and the national automobile shows held in New York and Chicago by the association are also open to all manufacturers. Outside manufacturers are also invited to co-operate in formulating and adopting various standards of business practice and manufacture, so that these will be truly representative of the entire industry. Thereby, the newer and smaller companies enjoy the benefit of the experience and moral support of the pioneers and largest manufacturers, practically without expense to themselves.

The purpose back of this policy is not to induce such companies to come into the fold, although any complete vehicle maker in good standing, who has been producing either passenger or commercial cars for a year is eligible to membership. The object is to encourage general practices that will be for mutual benefit.

The history of the associations dates back to October, 1900, when a call for a meeting of exhibitors who had engaged space at the Madison Square Garden automobile show to be held November 3 to 10, was issued by Emil Grossman & Bro., publishers of the *Motor Vehicle Review*. This meeting was held November 8 in the Hoffman House, New York, and was attended by representatives of eight automobile companies, two tire companies and a lubricant company, as follows:

Autocar Company
Duryea Power Company
Haynes-Apperson Automobile Co.
International Motor Carriage Co.
Locomobile Co. of America
Overman Automobile Co.
Steamobile Company
Winton Motor Carriage Co.
Diamond Rubber Company
Goodyear Tire & Rubber Co.
Jos. Dixon Crucible Co.

Acting as temporary chairman, Charles E. Duryea appointed a committee to call a second meeting to be held Saturday, November

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HOWARD E. COFFIN

Vice-President Hudson Motor Car Company. Chairman Naval Advisory Board. President Society of Automobile Engineers 1910. "Father of Standardization."

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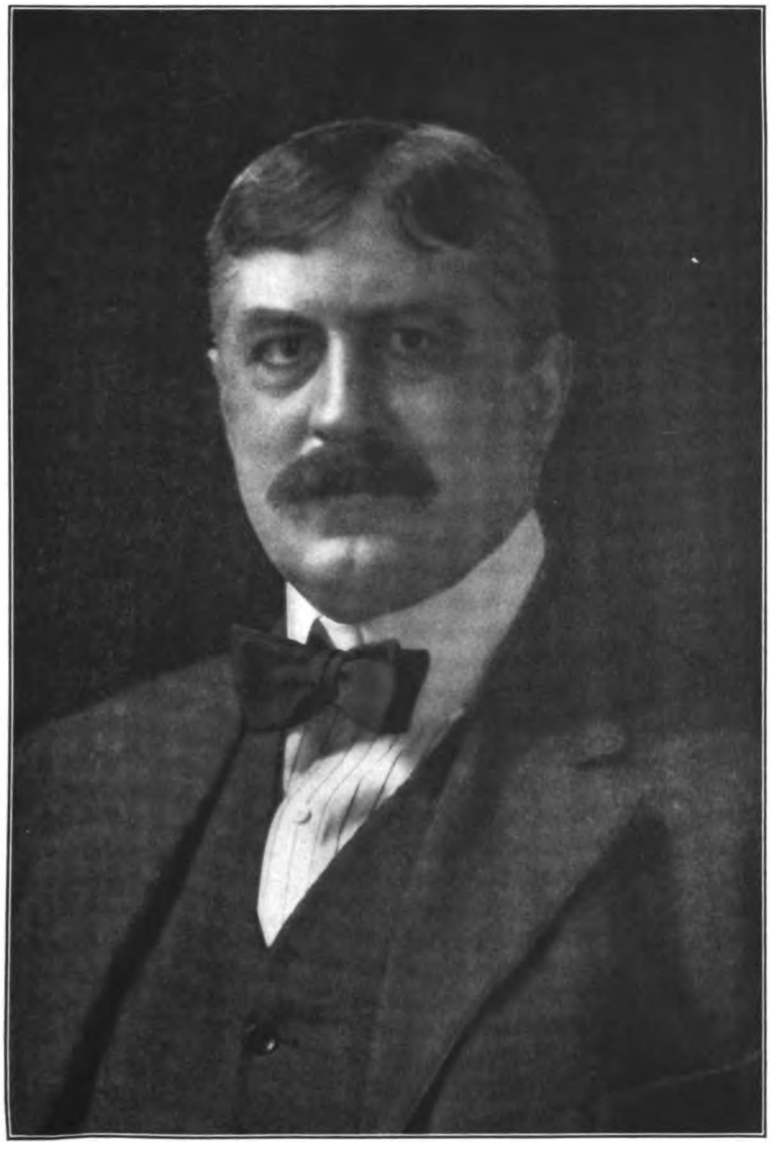

ANDREW LAWRENCE RIKER

Locomobile Company of America. Builder of first car sold in New York (1896). First President Society of Automobile Engineers. First Chairman Technical Committee A. L. A. M. Winner first road race on Long Island.

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10, in the press room at Madison Square Garden on the closing day of the show.

It is interesting to note, after the lapse of fifteen years, how nearly identical the objects of the present association are with the purposes of organization as outlined in the call then issued, which were as follows:

"To advance and protect the interests of the trade; to procure an adjustment of freight rates; to promote good roads; to procure proper legislation and the modification of recent rulings of the U. S. Treasury Department; to take needed action regarding future shows and exhibitions; and for such other matters as may properly come before the meeting."

At the second meeting a committee of eleven was appointed to arrange for a permanent organization of motor vehicle and parts makers, draft a constitution and by-laws, select officers for the first year and secure a certificate of incorporation. This committee consisted of:

S. T. Davis, Jr. . . .	Locomobile Co. of America
E. P. Wells	Steamobile Company
Charles E. Miller . .	
A. L. Riker	Riker Motor Vehicle Co.
Walter C. Baker . .	Baker Motor Vehicle Co.
John Brisben Walker .	Mobile Co. of America
Charles E. Duryea . .	Duryea Power Company
J. M. Hill	Electric Vehicle Co.
Alexander Winton . .	Winton Motor Carriage Co.
C. J. Field	DeDion-Bouton Motorette Co.
Arthur S. Winslow .	International Motor Carriage Co.

The committee on organization was instructed also to arrange for a general convention of members during the Pan-American Exposition in Buffalo the following year and to be the first of such conventions to be held annually thereafter.

Such was the unpretentious beginning of the association that has been such a power for harmony and the welfare of the industry.

Incidentally, there were fifty-four exhibitors in Madison Square Garden show that winter, including parts and accessory makers. Four days after the close of this show, another show opened in Grand Central Palace, with twenty-four exhibitors.

Permanent organization of the manufacturers was effected on or

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about December 1, 1900, at which the name National Association of Automobile Manufacturers was adopted and the following officers elected:

President	S. T. Davis, Jr.
First Vice-President . .	John H. Flagler
Second Vice-President .	J. Wesley Allison
Third Vice-President . .	C. J. Field
Secretary	E. P. Wells
Treasurer	D. S. Walker

Other directors elected were:

John Brisben Walker
Alexander Winton
J. M. Hill
A. L. Riker
Walter C. Baker
R. A. Ballantyne
F. D. Bradbury
A. S. Winslow
Charles E. Duryea

The constitution and by-laws provided for an active membership, to which manufacturers of automobiles were eligible, with initiation fee of $25 and annual dues of $10, and an associate membership for accessory makers, with dues of $15 the first year and $5 thereafter.

The organization started with thirty-eight charter members, of which twenty-four were vehicle makers and fourteen associate members. The list is of interest to-day for the survivals it shows.

ACTIVE MEMBERS

Baker Motor Vehicle Company
Buffalo-Electric Carriage Co.
Crescent Automobile Company
Daimler Manufacturing Company
DeDion-Bouton Motorette Company
Duryea Power Company
Electric Motor Vehicle Company
Haynes-Apperson Automobile Co.
International Motor Carriage Co.
Knox Automobile Company
Locomobile Co. of America
Mobile Co. of America
National Automobile & Electric Co.
New York Motor Vehicle Company

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CHARLES C. HANCH

Treasurer The Studebaker Corporation. Chairman Patents Committee N. A. C. of C. A Force for Harmony and sometimes called "Father of the Cross-Licensing Agreement."

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Ohio Automobile Company
Overman Automobile Company
Peerless Manufacturing Company
Riker Motor Vehicle Company
Springfield Cornice Works
St. Louis Motor Carriage Company
Steamobile Company
Upton Machine Company
Waltham Manufacturing Company
Winton Motor Carriage Compnay

ASSOCIATE MEMBERS

Baldwin Cycle & Chain Company
Columbia Lubricants Company
Dayton Electric Company
Diamond Rubber Company
Jos. Dixon Crucible Company
C. J. Downing
B. F. Goodrich Company
Goodyear Tire & Rubber Company
Gray & Davis
Hartford Rubber Tire Company
Charles E. Miller
Motsinger Device Company
Munger Vehicle Tire Company
Veeder Manufacturing Company

It was indicative of the future activities of the association and the foresight of its directors that one of the first acts of the executive committee was to announce the intention to participate in the New York and Chicago shows and in the Pan-American Exposition. It claimed the right of the manufacturers to join with the Automobile Club of America and the Chicago Automobile Club in the management and receipts of the New York and Chicago shows; and declared against supporting local shows in other cities and exhibiting at bicycle shows, then nearing extinction. In the course of a year or two S. A. Miles became general manager of the Association and conducted the Chicago shows.

Standardization work was started in 1902, when the Association

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approved a standard guarantee on automobiles, standard spacing of tire lugs and holes, standard rim sections and lamp brackets and proposed to standardize solid tire sections. It also resolved to petition Congress to enact a law placing a uniform license fee on motor vehicles for the entire country and resolved to approve the Brownlow bill to appropriate $20,000,000 of Federal funds for a national transcontinental highway. It was instrumental in securing a 50 per cent. reduction in marine insurance on automobiles exported.

At the end of 1902 the membership had increased to 129.

In October, 1903, the N. A. A. M. promoted and managed an endurance run from New York through Buffalo and Cleveland to Pittsburgh, which became notable in the annals of such contests because of a terrific three or four-day rainstorm that made the roads through the Catskill Mountains dangerous and almost impassable. Floods and washouts interrupted all other traffic, including that of the steam railroads and trolley lines, but most of the contesting automobiles finished the run in Pittsburgh.

The following year the Association held an exhibit in the St. Louis Exposition and participated in an endurance run from New York to the exposition in July, conducted by the American Automobile Association.

Four years after formation of the pioneer association, the manufacturers of parts and accessories, seeing that their interests and those of the complete vehicle makers were not identical in all respects, withdrew and formed the Motor and Accessory Manufacturers. Cordial relations have continued throughout, however, between the M. & A. M. and the parent organization, which allots preferred space in the national shows for the displays made by makers of parts and accessories.

Throughout the period following the first organization of the manufacturers, a cloud hung in the offing that later caused several years of trouble. It was the Selden patent, which had been bought up by the Electric Vehicle Company and under which a suit had been brought against the Winton Motor Carriage Company. A demurrer entered by the defendant was overruled by Judge Coxe of the U. S. Circuit Court in New York on November 9, 1900.

The owners of the patent began issuing licenses under it and on March 5, 1903, the Association of Licensed Automobile Manufacturers was organized to operate under the Selden patent, protect its members against infringement of their own individual patents and

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to assist in the development of the automobile along the most rapid and desirable line. The following officers were elected:

President	Frederick L. Smith (Olds Motor Works)
Vice-President	Barclay H. Warburton (Searchmont Automobile Co.)
Secretary and Treasurer	Henry B. Joy (Packard Motor Car Co.)
General Manager . . .	George H. Day (Electric Vehicle Co.)

The original members were:

Apperson Bros. Automobile Co.
Autocar Company
Electric Vehicle Company
H. H. Franklin Manufacturing Co.
Haynes-Apperson Company
International Motor Car Co.
Knox Automobile Company
Locomobile Co. of America
Olds Motor Works
Packard Motor Car Company
Pan-American Motor Company
Peerless Motor Car Company
George N. Pierce Company
Pope-Robinson Automobile Co.
Searchmont Automobile Company
J. Stevens Arms & Tool Company
U. S. Long Distance Automobile Co.
Waltham Manufacturing Company

The articles of association required each member, upon joining, to recognize the validity of the Selden Patent. All manufacturers and importers of gasoline motor cars were invited to take out licenses. Test suits were instituted against the Ford Motor Company as a manufacturer and John Wanamaker as a dealer, and dealers who handled licensed cars were not permitted to sell unlicensed cars.

In 1905 the A. L. A. M. stole a march on the N. A. A. M. in January by effecting an exclusive lease of Madison Square Garden

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for automobile show purposes before the National Association renewed its contract, and was thus able to shut independent manufacturers out. This move so stirred the unlicensed makers that during the Chicago show in February they met and organized the American Motor Car Manufacturers' Association, with a charter membership of twenty companies, as follows:

Acme Motor Car Company
Ardsley Motor Car Company
Austin Automobile Company
Bartholomew Company
Dayton Motor Car Company
Duryea Power Company
Ford Motor Company
Gas Engine & Power Company and Chas. L. Seabury Co., Con.
Jackson Automobile Company
Maxwell-Briscoe Company
Mitchell Motor Car Company
Moline Automobile Company
National Motor Vehicle Company
Nordyke & Marmon Company
Phelps Motor Vehicle Company
Premier Motor Manufacturing Company
Reliance Motor Car Company
Union Automobile Company
Wayne Automobile Company

James Couzens, of the Ford Motor Company, was elected chairman of the committee of management; A. C. Newby, of the National Motor Vehicle Company, vice-chairman; J. B. Bartholomew, Bartholomew Co., treasurer; William Mitchell Lewis, Mitchell Motor Car Co., secretary, and Benjamin Briscoe, Maxwell-Briscoe Company, auditor.

A charter of incorporation was taken out with objects as follows, although it was well understood that defense against the aggressions of the A. L. A. M. for mutual protection was the primary purpose:

"To promote shows, race meets and other means of publicity and advertisement.

"To promote the sale and use of motor cars.

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MILTON J. BUDLONG

Former General Manager A. L. A. M.
Late President Packard Motor Car Company of New York.

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"To advertise the merits of the respective cars made by the members.

"To secure the most favorable freight rates on cars.

"To furnish the members' agents with information about the automobile trade and latest details of construction of cars built by the members.

"To promote public interest in good roads and opposition to discriminatory legislation, and

"To further the exchange of scientific information by the engineers of the members with the object of improving the manufacture and standardization of motor cars."

With the organization of the A. M. C. M. A., of which Alfred Reeves became general manager, began a five-year industrial and legal battle which ended with the final decision of the U. S. Circuit Court of Appeals in New York, which handed down an opinion in 1911 that, while the Selden patent was valid, it was not infringed by the Ford Company.

Although the uncertainty over the litigation doubtless discouraged many people from rushing into the automobile business, there is no doubt that the rivalry between the associations and their respective members for supremacy was beneficial to the industry, for it resulted in rapid improvement in the quality of cars and kept the automobile prominently before the public.

Instead of one show in New York each winter there were two, for the "independents" hastened to form an alliance with the Automobile Club of America to hold a separate exhibition in the new 69th Regiment armory in 1906 during the same week with the A. L. A. M. show in Madison Square Garden, and in subseqeunt years the A. M. C. M. A. held several shows in the old Grand Central Palace.

MECHANICAL BRANCH OF THE A. L. A. M.

Elevation of the standard of excellence of the American motor car is due in a very large measure to the work of the Mechanical Branch of the Association of Licensed Automobile Manufacturers.

This branch was organized in 1905, two years after the formation of the Association of Licensed Automobile Manufacturers, and was inspired by George H. Day, then general manager of the association

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and formerly connected with the Electric Vehicle Co. of Hartford.

A. L. Riker, one of the leading pioneer automobile engineers, was appointed chairman of the Mechanical Branch, and Howard E. Coffin, another prominent pioneer engineer, was appointed chairman of the Committee on Tests. John Wilkinson, H. P. Maxim and Charles B. King, of Detroit, were also on the Committee on Tests.

An experimental and testing laboratory was established in Hartford, and Henry Souther, who had been associated with Mr. Day and the Pope Company, was engaged as consulting engineer in charge of the laboratory.

The Mechanical Branch was an informal organization of the engineers of the members of the Association of Licensed Automobile Manufacturers mainly for the purpose of bringing about better acquaintance among the engineers and factory superintendents and discussion of engineering and mechanical problems. It was organized as the result of a motor car run from New York to Ardsley in the Summer of 1905.

In the latter part of the year Coker F. Clarkson was made secretary of the Branch and continued in this capacity until 1910, when the work of the Branch was discontinued by the Association of Licensed Automobile Manufacturers, and all the records, laboratory apparatus and the engineering library were turned over to the Society of Automobile Engineers, formed in January, 1905, of which Mr. Clarkson subsequently became general manager.

About $50,000 was spent by the Mechanical Branch on the laboratory and other work during its five years' existence.

Among the notable work done was the establishment of screw thread standards in 1906; the reduction of tube sizes from about two thousand to between five hundred and six hundred standard sizes, which have since been further reduced to about one hundred and forty; testing of physical and chemical properties of steels and other metals and initiation of annual steel specifications; engine tests for inlet-valve closing, and tests of piston ring friction.

The branch conducted the first tests of steels made in the industry and had the first manograph in this country. It issued annual reports on the properties of steels, issued digests of technical literature and started a library of technical literature.

Frequent meetings of the engineers were held at which there were informal discussions but rarely any prepared papers. Runs were held

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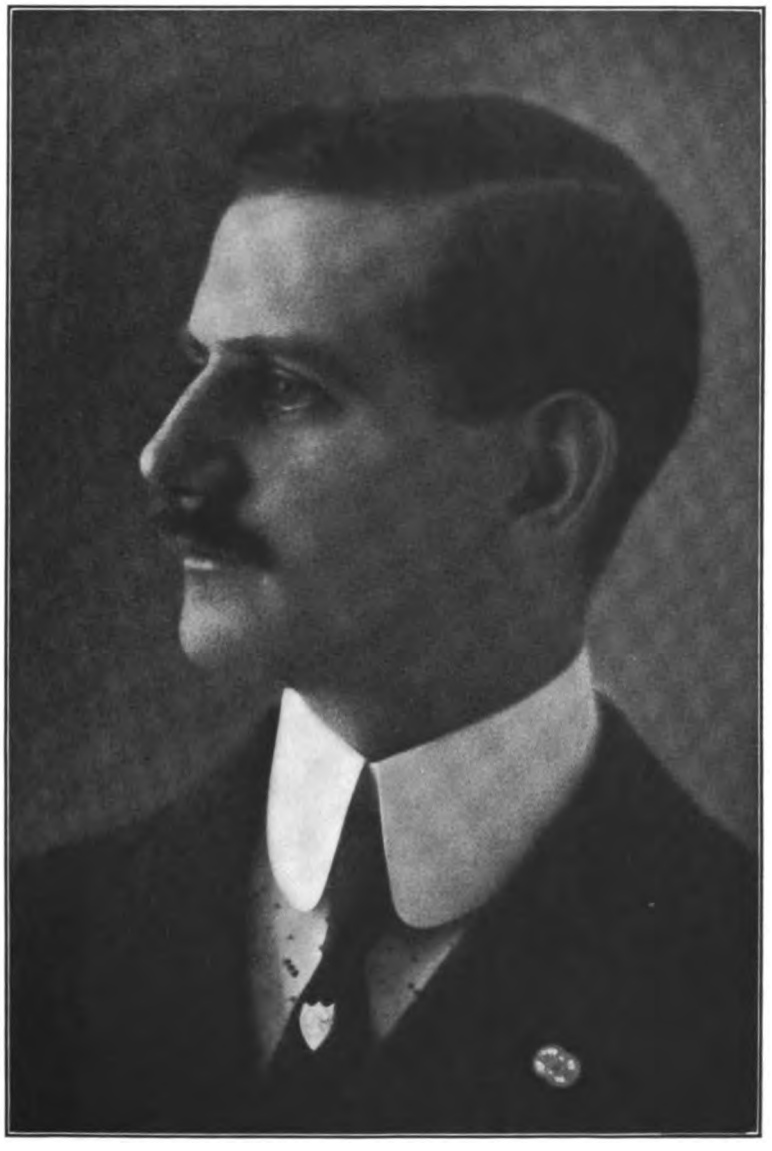

ALFRED REEVES
General Manager National Automobile Chamber of Commerce.

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SAMUEL ARTHUR MILES
The Showman of the Automobile Industry.

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every Summer and the engineers met in various parts of the country. The first of the boat trips and midsummer meetings, that are such a popular feature of the Society of Automobile Engineers, was held by the Mechanical Branch, which made a trip from Detroit to the St. Clair flats in the boat of Charles B. King.

Many lasting friendships were formed as a result of these meetings and trips, and the interchange of ideas and spirit of co-operation which characterized them laid the foundation for the rapid development of the great American automobile industry.

Export departments were formed by both the A. L. A. M. and the A. M. C. M. A. and foreign sales were pushed with a vigor that laid the foundation for a colossal export trade that in the fiscal year ended with June, 1915, amounted to 37,876 motor vehicles valued at $60,254,635.

Headquarters of all three associations were located in New York. From its organization the offices of the N. A. A. M. had been maintained in the Transit building, at 7 East 42nd Street. Adjoining offices were secured in the same building and on the same floor by the A. L. A. M. when it entered the field, and the A. M. C. M. A. secured offices on the same street only one block to the west.

From the earliest days, the manufacturers recognized the importance of good roads to the development of the industry, as shown by the objects of association as embraced in the constitutions of all of the associations. The N. A. A. M. coöperated with and gave its active support to the American Automobile Association in the good roads campaign which it has conducted energetically and with gratifying results.

MANUFACTURERS' CONTEST ASSOCIATION

A body that exercised a very important influence on the development of desirable standards for the government of automobile contests, and especially racing events, was the Manufacturers' Contest Association. The movement which resulted in the formation of this organization was started in 1908 by Howard E. Coffin, William E. Metzger and H. O. Smith, their purpose being to co-operate with the American Automobile Association in reconciling the conflicting interests of the Association of Licensed Automobile Manufacturers,

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the American Motor Car Manufacturers' Association, the Importers' Alliance and the various automobile clubs by means of drawing up regular rules and suggestions as to the general regulation of contests. Representatives of these interests formed the new association.

A conference was called at Chicago in 1909 between the various bodies mentioned, Mr. Coffin being made chairman. Later he was made chairman of the General Rules Committee of the Manufacturers' Contest Association and the rules drafted by that committee still govern all automobile contests. Mr. Coffin was president of the Manufacturers' Contest Association for two years. Among those who were prominent in its activities were: Benjamin Briscoe, Alfred Reeves, A. R. Pardington, E. R. Hollander, Paul La Croix, Lewis R. Speare and Samuel M. Butler.

The association cleared up a very unhealthy condition in the automobile contest field by the rules which it formulated for stock car events, its regulations as to cylinder-displacement, measures preventing the restriction of events to cars of one or two makes, etc.

The advisory committee consisted of E. P. Chalfant, representing the A. L. A. M.; Alfred Reeves, representing the A. M. C. M. A., and E. R. Hollander, representing the Importers' Automobile Salon.

THE END OF THE A. L. A. M.

Throughout the controversy over the Selden patent, the N. A. A. M. succeeded in preserving its neutrality—a feat rendered difficult because forty-three of its fifty-seven members had joined the Licensed association and representatives of licensed companies predominated on its executive committee and all or most of the other committees. At the same time, many of the other member companies had joined the "independent" group represented by the A. M. C. M. A. This produced a novel situation with regard to the shows, for, while each faction held its own national show in New York, the Chicago show, conducted by S. A. Miles under the auspices of the N. A. A. M., was always an open affair, in which members of both the other organizations participated on an equal basis and exhibited side by side in the Coliseum and First Regiment Armory under a suspension of hostilities.

Although neither steam nor electric vehicles were involved with

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the Selden patent, the effect of the fight over it was to center public attention upon the gasoline vehicle. This led the makers of electric vehicles to organize the Electric Vehicle Manufacturers' Association in February, 1906, during the Chicago show, with George Pope, president; George N. Studebaker, vice-president; M. L. Goss, treasurer, and Robert McA. Lloyd, secretary.

This organization was incorporated at Albany the same month with the objects of fostering trade, reforming abuses in business, and promoting harmony in the trade. It never figured prominently in the industry but was revived in 1914 and opened offices in Chicago, under the management of E. P. Chalfant, who was manager of the A. L. A. M. in 1909. Meanwhile, in May, 1910, a meeting of men interested in the sale and use of electric vehicles, electric current, batteries, tires and other accessories, was held in the offices of the New York Edison Company and formed the Electric Vehicle Association of America. Wm. H. Blood, Jr., was elected president, Frank W. Smith, vice-president; Day Baker, treasurer, and Harvey Robinson, secretary. From a charter membership of twenty-nine, this grew to 375 in 1912, with branches in Boston, Chicago, Philadelphia and on the Pacific Coast. Seventeen members were electric vehicle makers, of whom six were members of the N. A. A. M. A vigorous coöperative advertising and publicity campaign was begun that greatly increased interest in and sales of electric passenger and commercial vehicles.

The beginning of the end of the A. M. C. M. A. came in September, 1909, when Judge Hough, of the U. S. Circuit Court in New York, rendered a decision upholding the validity of the Selden patent. Between that time and the following January, when the New York shows were scheduled, most of the independents took out licenses. This brought the membership of the Licensed Association up to eighty-three. At the expiration of its five-year articles of agreement, in February, 1910, the A. M. C. M. A. was allowed to expire and the $60,000 in the treasury was divided among the forty-five members.

However, the Ford Company carried the case to the United States Circuit Court of Appeals, with the result that, in January, 1911, while the Madison Square Garden show was in its full glory, the Selden patent was finally disposed of by a decision reversing the lower court.

Forty members of the Licensed Association reorganized the fol-

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lowing April under the name Automobile Board of Trade, for the purpose of carrying on the shows, and protecting the rights of its members under other patents owned by them. Charles Clifton was elected president, C. C. Hanch, vice-president; George Pope, treasurer and Benjamin Briscoe, secretary. H. A. Bonnell was appointed general manager.

Work of the Mechanical Branch of the A. L. A. M. had previously been turned over to the Society of Automobile Engineers, which was organized at the Hotel Navarre, New York, on January 18, 1905, and had increased rapidly in membership and done much earnest work.

Except in patent matters, all the manufacturers' associations had interests in common, working for the advancement of the whole industry by promoting road improvement, opposing unjust legislation, promoting popular interest in the purchase and use of automobiles, and in other ways. The N. A. A. M. and the A. B. T. had interlocking directorates as well as many members in common. The uselessness of maintaining two organizations with the same objects and members was apparent, and the leaders in the industry soon began tactful efforts looking to consolidation. The makers were too liberal minded to allow past differences to stand in the way, and in April, 1913, the N. A. A. M. and the A. B. T. were both dissolved and their membership amalgamated in the National Automobile Chamber of Commerce. This was readily done, as at the time more than fifty of the sixty-seven members of the Board of Trade were members of the National Association, whose total membership was 105. Furthermore, two of the officers and all but two of the directors of the A. B. T. were members of the executive committee of the N. A. A. M.

Charles Clifton, who had presided over the affairs of the Licensed Association and the Automobile Board of Trade from 1904 to 1911, became president of the N. A. C. C.; George Pope, treasurer of the A. B. T., became treasurer; W. C. Leland, vice-president of the N. A. A. M., became vice-president; Roy D. Chapin, secretary of the N. A. A. M., was elected secretary, and S. A. Miles, general manager of the N. A. A. M., was appointed to the same office with the new organization.

In this connection, it is of interest to note by the accompanying table, how positions as officers of two or more of the associations have been occupied by.

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Charles Clifton	(Pierce-Arrow)
E. H. Cutler	(Knox)
W. E. Metzger	
S. T. Davis, Jr.	(Locomobile)
Thomas Henderson	(Winton)
L. H. Kittredge	(Peerless)
Benjamin Briscoe	(Maxwell-Briscoe)
R. E. Olds	(Reo)
George Pope	(Pope Mfg. Co.)
H. O. Smith	(Premier)
Henry B. Joy	(Packard)
R. D. Chapin	(Hudson)

These men, together with a number of others prominent in the industry and whose names appear among the lists of officers or who served on the executive committee of the N. A. A. M., the board of directors of the A. L. A. M., the A. B. T. and the N. A. C. C., or the committee of management of the A. M. C. M. A., have been highly influential in directing the policies of the associations and guiding the destinies of the American automobile industry. Great credit is freely given them for steering a progressive but safe course that in the period of fifteen years has lifted an infant industry to one of the foremost positions in American manufacture and placed it on a solid foundation commanding the respect of leading bankers, politicians, captains of industry, government officials and Congressmen, sociologists and the press of the country.

Never has the spirit of friendly co-operation been so pronounced as since the formation of the N. A. C. C., the general manager of which is Alfred Reeves, which embraces all of the prominent companies building passenger automobiles, with the exception of the Ford Motor Company, and most of the largest and most substantial makers of commercial motor vehicles, with a combined output of more than 50 per cent. of all the motor vehicles manufactured annually in the United States. The Ford Company automatically dropped out when the N. A. A. M. was dissolved and has since pursued an independent and individual course.

In January, 1916, the National Automobile Chamber of Commerce had a membership of ninety-eight as follows:

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Abbott-Detroit, Consolidated Car Company, Detroit, Mich.
Allen, Allen Motor Company, Fostoria, Ohio.
American-Argo, Argo Electric Vehicle Company, Saginaw, Mich.
American-Borland, Borland-Grannis Company, Saginaw, Mich.
American-Broc, American Electric Car Company, Saginaw, Mich.
American LaFrance, American LaFrance Fire Engine Co., Elmira, N. Y.
Apperson, Apperson Brothers Auto. Company, Kokomo, Ind.
Argo (Gasoline), Argo Motor Company, Jackson, Mich.
Auburn, Auburn Automobile Company, Auburn, Ind.
Austin, Austin Automobile Company, Grand Rapids, Mich.
Autocar, Autocar Company, Ardmore, Pa.
Avery, Avery Company, Peoria, Ill.
Baker, Baker R. & L. Company, Cleveland, Ohio.
Briscoe, Briscoe Motor Corp., Jackson, Mich.
Buick, Buick Motor Company, Flint, Mich.
Cadillac, Cadillac Motor Car Company, Detroit, Mich.
Cartercar, Cartercar Company, Pontiac, Mich.
Case, J. I. Case T. M. Co., Racine, Wis.
Chalmers, Chalmers Motor Company, Detroit, Mich.
Chandler, Chandler Motor Car Company, Cleveland, Ohio.
Chevrolet, Chevrolet Motor Company, Flint, Mich.
Cole, Cole Motor Car Company, Indianapolis, Ind.
Cunningham, Jas. Cunningham, Son & Co., Rochester, N. Y.
Denby, Denby Motor Truck Company, Detroit, Mich.
Detroit, Anderson Electric Car Company, Detroit, Mich.
Detroiter, Briggs-Detroiter Company, Detroit, Mich.
Dodge Brothers, Dodge Brothers, Detroit, Mich.
Dort, Dort Motor Car Company, Flint, Mich.
Elcar, Elkhart Carriage & Motor Co., Elkhart, Ind.
Empire, Empire Automobile Company, Indianapolis, Ind.
Federal, Federal Motor Truck Company, Detroit, Mich.
Fiat, F. I. A. T., Poughkeepsie, N. Y.
Franklin, H. H. Franklin Manufacturing Co., Syracuse, N. Y.
G M C, General Motors Truck Company, Pontiac, Mich.
G. V. Electric, General Vehicle Company, Long Island City, N.Y.
G. V. Mercedes, General Vehicle Company, Long Island City, N. Y.
Garford, Gramm Motor Truck Company, Lima, Ohio.

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Glide, Avery Company, Peoria, Ill.
Grant, Grant Motor Company, Findlay, Ohio.
Great Western, Great Western Auto. Company, Peru, Ind.
Haynes, Haynes Automobile Company, Kokomo, Ind.
Hewitt, Hewitt Motor Company, New York, N. Y.
Hollier, Lewis Spring & Axle Company, Jackson, Mich.
Hudson, Hudson Motor Car Company, Detroit, Mich.
Hupmobile, Hupp Motor Car Corp., Detroit, Mich.
Imperial, Mutual Motors Company, Jackson, Mich.
Inter-State, Inter-State Motor Company, Muncie, Ind.
Jackson, Jackson Automobile Company, Jackson, Mich.
Jeffery, Thomas B. Jeffery Company, Kenosha, Wis.
Kelly, Kelly-Springfield Motor Truck Co., Springfield, Ohio.
King, King Motor Car Company, Detroit, Mich.
International Harvester Co., Chicago, Ill.
Kissel Kar, Kissel Motor Car Company, Hartford, Wis.
Kline Kar, Kline Motor Car Corporation, Richmond, Va.
Lexington, Lexington-Howard Company, Connersville, Ind.
Locomobile, Locomobile Company of America, Bridgeport, Conn.
Lozier, Lozier Motor Company, Detroit, Mich.
Lyons-Knight, Lyons-Atlas Company, Indianapolis, Ind.
Mack, Mack Brothers Motor Car Company, New York, N. Y.
McFarlan, McFarlan Motor Company, Connersville, Ind.
Marion, Mutual Motors Company, Jackson, Mich.
Marmon, Nordyke & Marmon Company, Indianapolis, Ind.
Maxwell, Maxwell Motor Company, Detroit, Mich.
Mercer, Mercer Automobile Company, Trenton, N. J.
Milburn, Milburn Wagon Company, Toledo, Ohio.
Mitchell, Mitchell-Lewis Motor Company, Racine, Wis.
Moline-Knight, Moline Automobile Company, East Moline, Ill.
Moon, Moon Motor Car Company, St. Louis, Mo.
National, National Motor Vehicle Company, Indianapolis, Ind.
Oakland, Oakland Motor Car Company, Pontiac, Mich.
Ohio, Ohio Electric Car Company, Toledo, Ohio.
Oldsmobile, Olds Motor Works, Lansing, Mich.
Overland, Willys-Overland Company, Toledo, Ohio.
Packard, Packard Motor Car Company, Detroit, Mich.
Paige, Paige-Detroit Motor Car Company, Detroit, Mich.
Paterson, W. A. Paterson Company, Flint, Mich.

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Pathfinder, Pathfinder Company, Indianapolis, Ind.
Peerless, Peerless Motor Car Company, Cleveland, Ohio.
Pierce-Arrow, Pierce-Arrow Motor Car Company, Buffalo, N. Y.
Pope-Hartford, The Pope Manufacturing Company, Hartford, Conn.
Premier, Premier Motor Manufacturing Co., Indianapolis, Ind.
Pullman, Pullman Motor Car Company, York, Pa.
Rauch & Lang, Baker R. & L. Company, Cleveland, Ohio.
Regal, Regal Motor Car Company, Detroit, Mich.
Reo, Reo Motor Car Company, Lansing, Mich.
Saurer, Saurer Motor Company, New York, N. Y.
Saxon, Saxon Motor Company, Detroit, Mich.
Scripps-Booth, Scripps-Booth Company, Detroit, Mich.
Selden, Selden Motor Vehicle Company, Rochester, N. Y.
Stearns-Knight, F. B. Stearns Company, Cleveland, Ohio.
Stevens-Duryea, Stevens-Duryea Company, Chicopee Falls, Mass.
Sterling, Sterling Motor Truck Company, West Allis, Wis.
Studebaker, Studebaker Corporation, Detroit, Mich.
Stutz, Stutz Motor Car Company, Indianapolis, Ind.
Velie, Velie Motor Vehicle Company, Moline, Ill.
Vim, Vim Motor Truck Company, Philadelphia, Pa.
Walter, Walter Motor Truck Company, New York, N. Y.
Waverley, The Waverley Company, Indianapolis, Ind.
Westcott, Westcott Motor Car Company, Richmond, Ind.
White, The White Company, Cleveland, Ohio.
Willys-Knight, Willys-Overland Company, Toledo, Ohio.
Winton, The Winton Company, Cleveland, Ohio.
Woods, Woods Motor Vehicle Company, Chicago, Ill.

Briefly summarized, the objects of association as stated in the constitution of the N. A. C. C. are:

"to promote the interests of those engaged in the motor vehicle industry; reform abuses; oppose unjust legislation; secure equitable railroad rates and service; diffuse information as to inventions, patents, state of the art, and conditions of trade in which members are engaged; procure uniformity of usages in the trade; further standardization in engineering and manufacturing for the ultimate benefit of the public; promote construction of better highways; advocate enactment of equitable laws; settle differences between members; promote and enlarge

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friendly intercourse among men engaged in the industry, and to acquire, hold and dispose of property, including patents and patent rights, for the benefit of members, but not for the profit of the chamber."

Pursuant of these objects the chamber conducts active show, traffic and patents departments and has standing committees on patents, shows, traffic, legislation, good roads, commercial vehicles and electric vehicles. It has three second vice-presidents, each in charge of matters pertaining to a division of the industry, as gasoline passenger cars, commercial vehicles and electric vehicles.

The traffic department is constantly on the alert to secure the most advantageous freight rates and the prompt return of automobile freight cars to the factories by the railroads so that shipments will not be delayed, checks freight bills of members and collects over-charges from the railroads for members.

The legislative committee has helped to prevent the passage of hundreds of unreasonable and discriminatory automobile bills in state legislatures by force of argument and advocated fair and reasonable legislation. It also presented arguments before Congress in 1914 that showed senators and representatives the unjustness of subjecting motor vehicles to a federal emergency tax in addition to a state and local registration and personal property taxation.

The commercial vehicle committee has held three motor truck conventions to which all truck makers were invited and approved standard speed ratings, body weight allowances, caution plate against overloading and overspeeding, standard demonstration charges and standard frame widths and lengths.

The patent department investigates charges of patent infringement against members and secures licenses on favorable terms for members under patents that are valid.

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OFFICERS OF MANUFACTURERS' NATIONAL ASSOCIATIONS FOR FIFTEEN YEARS

Office	*Year*	*N. A. A. M.*	*A. L. A. M.*	*A. M. C. M. A.*	*A. B. T.*	*N. A. C. C.*
President [1]	1900	S. T. Davis, Jr.				
	1901	S. T. Davis, Jr.				
	1902	Milton J. Budlong	Fred L. Smith			
	1903	Windsor T. White	Fred L. Smith			
	1904	E. H. Cutler	Charles Clifton	James Couzens		
	1905	E. H. Cutler	Charles Clifton	James Couzens		
	1906	Albert L. Pope	Charles Clifton	Benjamin Briscoe		
	1907	Thos. Henderson	Charles Clifton	Benjamin Briscoe		
	1908	S. D. Waldon	Charles Clifton	Harold O. Smith		
	1909	L. H. Kittridge	Charles Clifton			
	1910	Wm. E. Metzger			Charles Clifton	
	1911	Wm. E. Metzger			Charles Clifton	
	1912	Wm. E. Metzger			Charles Clifton	Charles Clifton
	1913					Charles Clifton
	1914					Charles Clifton
	1915					

[1] In the A. M. C. M. A. this office was designated "Chairman of the Committee of Management."

Vice-President [2]	1900	John H. Flagler				
	1901	John H. Flagler				
	1902	A. L. Riker				
	1903	H. Ward Leonard	B. H. Warburton			
	1904	Charles Clifton	Charles Clifton			
	1905	Geo. W. Bennett	Wm. E. Metzger	A. C. Newby		
	1906	Geo. W. Bennett	Wm. E. Metzger	A. C. Newby		
	1907	S. D. Waldon	Thos. B. Henderson	R. E. Olds		
	1908	S. D. Waldon	Thos. B. Henderson	R. E. Olds		
	1909	Wm. E. Metzger	Thos. B. Henderson	C. G. Stoddard		
	1910	Wm. E. Metzger	S. T. Davis, Jr.			
	1911	Benj. Briscoe			C. C. Hanch	
	1912	Benj. Briscoe			C. C. Hanch	
	1913				C. C. Hanch	W. C. Leland
	1914					W. C. Leland
	1915					W. C. Leland

[2] In the A. M. C. M. A. this office was designated "Vice Chairman of the Committee of Management."

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OFFICERS OF MANUFACTURERS' NATIONAL ASSOCIATIONS FOR FIFTEEN YEARS

Office	Year	N.A.A.M.	A.L.A.M.	A.M.C.M.A.	A.B.T.	N.A.C.C.
2nd Vice-President	1900	J. W. Allison				
	1901	J. W. Allison				
	1902	C. J. Field				
	1903	Windsor T. White				
	1904	E. H. Cutler				
	1905	Albert L. Pope				
	1906	Albert L. Pope				
	1907	Thos. Henderson				
	1908	Wm. E. Metzger				
	1909	L. H. Kittredge				
	1910	C. C. Hildebrand				
	1911	H. O. Smith				
	1912	H. O. Smith				
2nd Vice-Presidents	1913					Hugh Chalmers Windsor T. White H. H. Rice
	1914					Hugh Chalmers Windsor T. White H. H. Rice
	1915					Hugh Chalmers Windsor T. White H. H. Rice
3rd Vice-President	1900	C. J. Field				
	1901	C. J. Field				
	1902	Dave E. Rianhard				
	1903	Charles Clifton R. E. Olds				
	1904	J. W. Allison Geo. W. Bennett				
	1905	S. D. Waldon				
	1906	S. D. Waldon				
	1907	Wm. E. Metzger				
	1908	L. H. Kittredge				
	1909	C. C. Hildebrand				
	1910	Benjamin Briscoe				
	1911	S. T. Davis, Jr.				
	1912	S. T. Davis, Jr.				

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OFFICERS OF MANUFACTURERS' NATIONAL ASSOCIATIONS FOR FIFTEEN YEARS

Office	*Year*	*N.A.A.M.*	*A.L.A.M.*	*A.M.C.M.A.*	*A.B.T.*	*N.A.C.C.*
Secretary	1900	E. P. Wells				
	1901	E. P. Wells				
	1902	Harry Unwin	Henry B. Joy E. H. Cutler			
	1903	A. B. Tucker J. W. Allison	L. H. Kittredge			
	1904	Percy Owen	L. H. Kittredge	Wm. Mitchell Lewis		
	1905	Percy Owen	L. H. Kittredge	Wm. Mitchell Lewis		
	1906	L. H. Kittredge	L. H. Kittredge	Wm. Mitchell Lewis		
	1907	C. C. Hildebrand	L. H. Kittredge	Wm. Mitchell Lewis		
	1908	Benjamin Briscoe	L. H. Kittredge	W. H. Van Dervoort		
	1909	H. O. Smith	L. H. Kittredge			
	1910	R. D. Chapin				
	1911	R. D. Chapin			Benj. Briscoe	
	1912				Benj. Briscoe	R. D. Chapin
	1913				R. D. Chapin	R. D. Chapin
	1914					R. D. Chapin
	1915					
Treasurer	1900	David S. Walker				
	1901	David S. Walker				
	1902	Percy Owen				
	1903	Percy Owen	Henry B. Joy			
	1904	Wm. R. Innis	H. H. Franklin			
	1905	Wm. R. Innis	H. H. Franklin	J. B. Bartholomew		
	1906	Wm. R. Innis	H. H. Franklin	J. B. Bartholomew		
	1907	Wm. R. Innis	H. H. Franklin	H. O. Smith		
	1908	Wm. R. Innis	H. H. Franklin	H. O. Smith		
	1909	Wm. R. Innis	George Pope	S. H. Mora		
	1910	Wm. R. Innis	George Pope			
	1911	Wm. R. Innis			George Pope	
	1912	H. H. Rice			George Pope	George Pope
	1913				George Pope	George Pope
	1914					George Pope
	1915					

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OFFICERS OF MANUFACTURERS' NATIONAL ASSOCIATIONS FOR FIFTEEN YEARS

Office	Year	N.A.A.M.	A.L.A.M.	A.M.C.M.A.	A.B.T.	N.A.C.C.
Auditor	1905			Benjamin Briscoe		
	1906			Benjamin Briscoe		
	1907			Roger J. Sullivan		
	1908			Wm. H. Van Dervoort		
	1909			Wm. H. Van Dervoort		
General Manager	1903	S. A. Miles	George H. Day			
	1904	S. A. Miles	George H. Day			
	1905	S. A. Miles	George H. Day			
	1906	S. A. Miles	George H. Day	Roger B. McMullen		
	1907	S. A. Miles	George H. Day	Alfred Reeves		
	1908	S. A. Miles	Milton J. Budlong	Alfred Reeves		
	1909	S. A. Miles	E. P. Chalfant	Alfred Reeves		
	1910	S. A. Miles	Alfred Reeves			
	1911	S. A. Miles			H. A. Bonnell	
	1912	S. A. Miles			H. A. Bonnell	
	1913				H. A. Bonnell	S. A. Miles
	1914					Alfred Reeves
	1915					Alfred Reeves

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N. A. C. OF C. CROSS-LICENSING AGREEMENT

Probably no feature of the work of the automobile manufacturers' association has created such interest and wonderment among other industries as the cross-licensing agreement in regard to patents, put into effect among the members of the National Automobile Chamber of Commerce toward the close of 1915.

That nearly one hundred members of an association bound together by no formal agreements should voluntarily agree to allow one another to make use of any or all of the features of construction and equipment covered by the patents owned by them individually, without payment of royalties or any other compensation, reflects the remarkably friendly and broad-minded spirit of co-operation for which the automobile industry has become famous and which places it in a class by itself.

The cross-licensing agreement involves upward of 500 patents owned by about half the membership of the Chamber and eliminates all patent disputes as a probable cause of litigation and disruption of friendly relations among the members, thereby insuring continued close co-operation in the work of the organization for the advancement of the automobile industry of America as a whole.

It was by no means a simple and easy matter to bring this situation about. Most of the credit for its successful culmination is due to the energy, tact and hard work of C. C. Hanch, chairman of the Patents Committee, and his co-laborers on the committee, Wilfred C. Leland, Howard E. Coffin, Windsor T. White and W. H. Van Dervoort. The legal work in connection with the drawing up of the form of agreement, etc., was done by Frederick Fish, patent counsel of the National Automobile Chamber of Commerce, assisted by Robert A. Brannigan, manager of the patent department of the Chamber.

The idea of the cross-licensing agreement was discussed tentatively some years ago by the Association of Licensed Automobile Manufacturers, but was considered an impracticable ideal, highly desirable but impossible to effect. When it was broached to Mr. Fish, who had had many years' experience in patent matters with other large industries, he did not hesitate to say that it would be impossible to get the members of the automobile manufacturers' association to sign such an agreement in sufficient number to make it effective, and prob-

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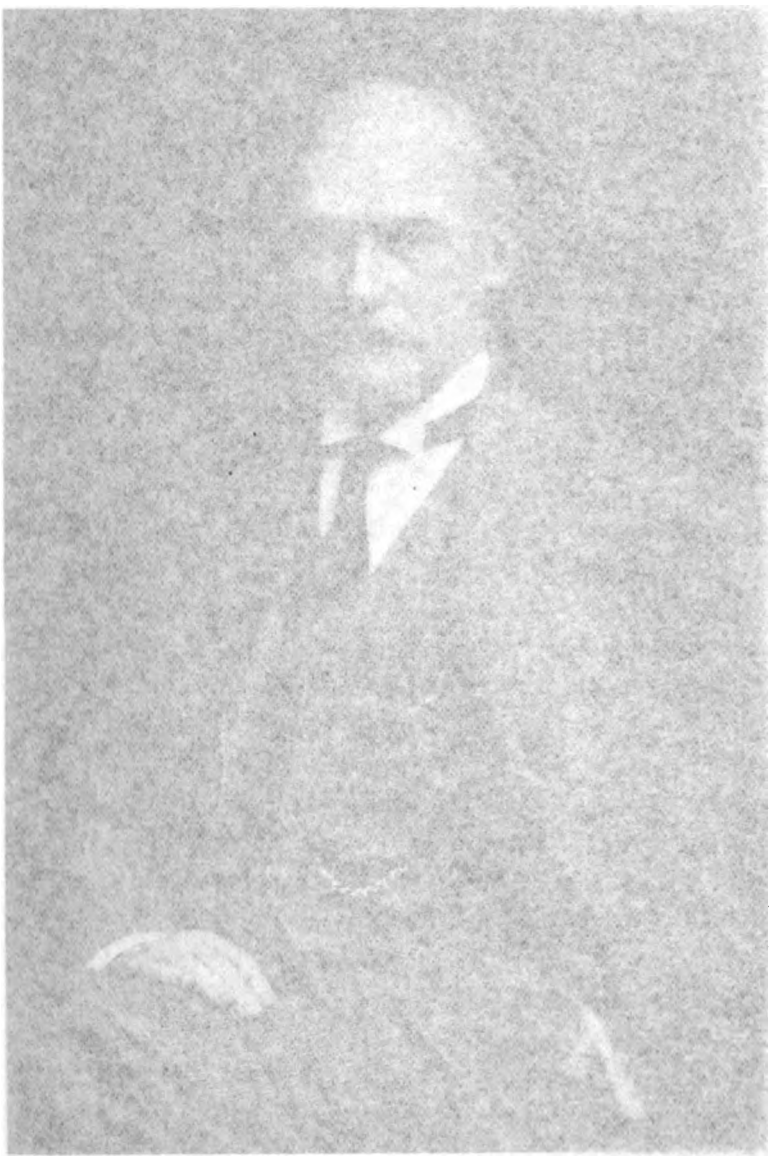

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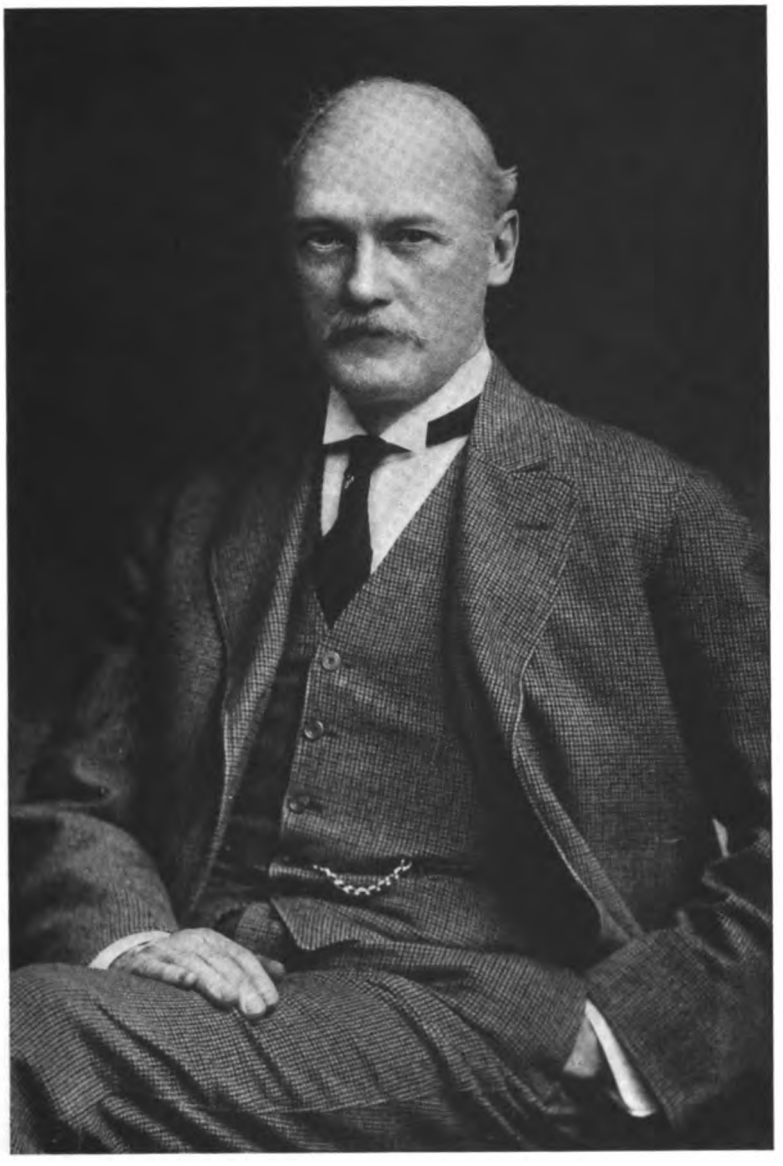

CHARLES CLIFTON

Head of organized automobile manufacturing for a decade. President National Automobile Chamber of Commerce. Treasurer and General Manager of the Pierce-Arrow Motor Car Company for many years.

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ably no one has been more surprised than he by the successful outcome of efforts covering 1914 and 1915.

It is very doubtful if the outcome would have been so good had it not been for the Kardo litigation and a threatened crop of other patent suits such as have been a tremendous expense and bugbear to the electrical, carriage and wagon, agricultural implement and other industries. The desire to avoid such a calamity in the automobile business was the motive behind the proposal of the cross-licensing agreement and the willingness of the manufacturers to beeome parties to it.

The efforts of the Patents Committee were most ably supported by Col. Charles Clifton, president; Hugh Chalmers, vice-president, and several other directors of the Chamber.

CHARLES CLIFTON

The head of organized automobile manufacturing is Charles Clifton, president of the National Automobile Chamber of Commerce. Col. Clifton is the only executive who has served in that organization; the only head the Automobile Board of Trade ever had, and was the head of the Association of Licensed Automobile Manufacturers during all of its existence except for a brief period before it had attained its significant growth.

For ten solid years he has been the executive head of the organizations that represented a clear majority of American manufacturing in the motor car line.

Col. Clifton is an intense believer in the automobile as fundamental transportation and has participated in every step of its development since 1898. He became a member of the basic organization upon its formation and assumed leadership in a short time.

Faith is the predominant quality that he has shown in his relations with the industry, as can be well understood from a glance over several of the articles and sketches published in this work.

The whole history of automobile manufacturing is almost dramatic. The great battles have all the spectacular and human interest elements of romance. The little and big things upon which great developments have turned, make up a series of stories that are unusually interesting and Col. Clifton, the silent, self-contained diplomat, who by the way

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can be extraordinarily eloquent on occasion, has presided over the councils where the action of the pictures has been planned.

In the early days of the automobile it was necessary to inspire confidence in the public, not only in the quality and service of the car, but also in the companies and men who made it. Col. Clifton, a conservative in appearance, but a radical in action, was chosen to head the organization. His dignified administration and powerful action, furnished the required elements.

In the manufacturing industry, Col. Clifton is treasurer, director and a large stockholder in the Pierce-Arrow Motor Car Company. The measure of the man, so far as the industry is concerned, is to be found in his profound faith, not only in Pierce-Arrow, which is high and abiding, but also in the industry as a whole.

Back in the days when his company scored its first big success, an important section of the stockholders did not have the same high degree of faith that Col. Clifton always has displayed. They felt that the industry was more or less of a bubble and consequently urged the directors to divide the surplus among them, resulting from the first few years of very profitable operation.

They did not favor laying out a huge sum on the building and improvement of the manufacturing plant, because they did not, deep in their hearts, believe that the business was going to be a permanent growing institution. They wanted the great surplus turned over to them as dividends.

Against this attitude, the diplomacy of Clifton availed little, but his strength, some call it stubbornness, finally prevailed. It was the compromise effected upon the basis of Clifton's position that made possible the present status of Pierce-Arrow.

If the surplus had been distributed as earned, the plant might have floated capital issues and achieved its growth, but in that day, money for automobile making was not so easy to get and viewed in the most favorable light, the chances are strongly against such a development. At any rate, the ideas of Col. Clifton and his associates have worked out for the good of the industry and the others might have been very unsatisfactory.

He specialized in the financial end of the business and the coöperation between his department and the manufacturing, under Vice-President Henry Mays and the Engineering Department under David Fergusson has been well co-ordinated and efficient.

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So, aside from his service as executive head of the manufacturing organization, Col. Clifton has helped the development of the automobile by his unwavering belief in it.

He was born September 20, 1853, at Buffalo, N. Y.; educated in the public schools of that city and has been a respected citizen of Buffalo all his life.

MOTOR AND ACCESSORY MANUFACTURERS, INC.

There is no company in the world that makes automobiles from tires to top and from tail-light to radiator. There are several that make no parts whatever and the majority of all automobile manufacturing companies make less than 20 per cent. of the parts included in their production. A few manufacture half the things used in making up the cars that bear their names and there is one, certainly and perhaps two others that exceed this proportion.

Viewed in the broadest way, it may be said that fully three-quarters of the manufacturing output of the car division of the industry has its source in the plants of the parts makers.

The fundamental reason for this condition lies in the progress that has been made in developing the idea of quantity production. For instance, no automobile company makes tires for its cars; the reasoning being that even Ford, reckoned on the basis of 600,000 cars annually, would require 2,400,000 tires to equip its current output, while it is likely that at this time there are over 1,500,000 Ford cars in use, requiring at least 9,000,000 tires a year to keep them on the road. Other makes now in use that require the same size and quality of tire as the Ford, probably account for another million casings a year and the manufacturers of tires can make millions of tires a year at less cost and containing more quality than any automobile manufacturer could put into them, if his market was limited to the exclusive equipment of his own output. It has been found that within certain limits it is cheaper and better for the automobile manufacturer to buy, rather than make parts.

This practice does not tend to take away the individuality of the various makes of cars, for the engineers draw their own specifications and the parts turned out under them must reflect the ideas of the individual companies. It simply takes advantage of the opportunity to

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shift the burden of manufacturing and the overhead expense of conducting separate factories to the shoulders of the concerns that specialize in such lines of manufacture. The consideration is the manufacturing profit, but in the aggregate this would not equal the extra cost of individual manufacture.

Another example of this truth is contained in the manufacture of cylinder castings. It would be madness on the part of an automobile manufacturer to install a foundry to make 500 sets of cylinders, when he can have the work done in a week by one of the established concerns specializing in that kind of manufacturing at a price that would save a material amount on the order. Lamps, radiators, carbureters, magnetos, electrical equipment, bodies and several other elements in automobile manufacture are made by accessory manufacturers, almost exclusively.

Thus, the business of making parts, accessories and sundries is a major factor in the automobile industry and the Motor and Accessory Manufacturers, Incorporated, is one of the most important elements in the industry.

This association was founded in 1904, thirty-seven important companies subscribing as charter members. The list of these pioneers is as follows:

CHARTER MEMBERS

American Ball Bearing Co., Cleveland, Ohio.
American Coil Co., South Somerville, Mass.
The Badger Brass Mfg. Co., Kenosha, Wis.
The Baldwin Chain & Mfg. Co., Worcester, Mass.
The Billings & Spencer Co., Hartford, Conn.
S. F. Bowser & Co., Fort Wayne, Ind.
Briscoe Mfg. Co., Detroit, Mich.
Brown-Lipe Gear Co., Syracuse, N. Y.
Byrne, Kingston & Co., Kokomo, Ind.
Dayton Electrical Mfg. Co., Dayton, Ohio.
The Diamond Rubber Co., Akron, Ohio.
R. E. Dietz Co., New York, N. Y.
The Fisk Rubber Co., Chicopee Falls, Mass.
G & J Tire Co., Indianapolis, Ind.
The B. F. Goodrich Co., Akron, Ohio.
The Goodyear Tire & Rubber Co., Akron, Ohio.

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Gray & Davis, Amesbury, Mass.
The R. E. Hardy Co., Detroit, Mich.
The Hartford Rubber Works Co., Hartford, Conn.
Hine-Watt Co., Chicago, Ill.
Hyatt Roller Bearing Co., Newark, N. J.
Phineas Jones & Co., Newark, N. J.
Midgley Mfg. Co., Columbus, Ohio.
Morgan & Wright, Chicago, Ill.
Motsinger Device Mfg. Co., Pendleton, Ind.
National Carbon Co., Cleveland, Ohio.
Salisbury Wheel & Mfg. Co., Jamestown, N. Y.
Shelby Steel Tube Co., Pittsburgh, Pa.
C. F. Splitdorf Co., New York, N. Y.
The Standard Welding Co., Cleveland, Ohio.
Timken Roller Bearing Axle Co., Canton, Ohio.
Twentieth Century Mfg. Co., New York, N. Y.
The Veeder Mfg. Co., Hartford, Conn.
Warner Gear Co., Muncie, Ind.
Weston-Mott Co., Utica, N. Y.
Whitlock Coil Pipe Co., Hartford, Conn.
Whitney Mfg. Co., Hartford, Conn.

The objects of the association were and are to promote in all lawful ways the interests of makers of motors, motor-parts and accessories; to aid in the protection of its members; to secure the advantages to be obtained by mutual co-operation; to facilitate the collection of claims and the diffusion of trade information, credits and other matters of interest to members.

Membership in the association is limited to manufacturers whose product is used exclusively on, or in connection with, motor vehicles, or used sufficiently in such connection as to warrant the board of directors in pronouncing them eligible. This limitation and exception give the board a certain discretionary right in treating applications.

The first form of the association was completed with nine New England manufacturers; twenty companies in the middle west and eight located in New York and New Jersey.

D. J. Post of the Veeder Manufacturing Company of Hartford, Conn., was elected president and the first roster of officers and members of the board appears below:

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President, D. J. Post, Veeder Manufacturing Company, Hartford, Conn.

First Vice-President, H. E. Raymond, B. F. Goodrich Company, Akron, Ohio.

Second Vice-President, H. W. Chapin, Brown-Lipe Gear Company, Syracuse, N. Y.

Third Vice-President, H. P. Jones, Phineas Jones & Company, Newark, N. J.

Secretary, F. E. Castle, Twentieth Century Manufacturing Company, New York, N. Y.

Treasurer, W. S. Gorton, Standard Welding Company, Cleveland, Ohio.

Director, H. T. Dunn, The Fisk Rubber Company, Chicopee Falls, Mass.

Director, H. H. Timken, Timken Roller Bearing Axle Company, Canton, Ohio.

Director, H. O. Smith, G & J Tire Company, Indianapolis, Ind.

Director, R. H. Welles, Badger Brass Manufacturing Company, Kenosha, Wis.

Director, P. L. Hussey, Hussey Drop Forge Manufacturing Company, Cleveland, Ohio.

Director, V. G. Apple, The Dayton Electric & Manufacturing Company, Dayton, Ohio.

Director, F. C. Billings, The Billings & Spencer Company, Hartford, Conn.

Seven of the charter members were tire manufacturers; five were makers of electrical equipment and the remainder made bearings, lamps, chains, drop forgings, tanks and pumps, gears, carbureters, wheels, steel and metal castings, axles and various other items.

It was a characteristic list showing promise in a dim way of the present scope of the industry, but actually giving only a hint of its future importance.

The association, once fairly started, grew with rapidity and at the end of the first year, the report of Mr. Post showed a total membership of ninety-four concerns, as follows:

1904 MEMBERSHIP

American Ball Bearing Co., Cleveland, Ohio.

American Coil Co., South Somerville, Mass.

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American Roller Bearing Co., South Framingham, Mass.
Aurora Automatic Machine Co., Chicago, Ill.
Autocoil Co., Jersey City, N. J.
The Badger Brass Mfg. Co., Kenosha, Wis.
The Baldwin Chain & Mfg. Co., Worcester, Mass.
The Billings & Spencer Co., Hartford, Conn.
S. F. Bowser & Co., Fort Wayne, Ind.
Brennan Mfg. Co., Syracuse, N. Y.
Briscoe Mfg. Co., Detroit, Mich.
W. H. Brown, Cleveland, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Brown-Lipe Gear Co., Syracuse, N. Y.
Byrne, Kingston, & Co., Kokomo, Ind.
Carlysle-Johnson Machine Co., Hartford, Conn.
Cleveland Car Specialty Co., Cleveland, Ohio.
Consolidated Mfg. Co., Toledo, Ohio.
Continental Motor Mfg. Co., Chicago, Ill.
Continental Rubber Works, Erie, Pa.
The Crosby Co., Buffalo, N. Y.
Dayton Electrical Mfg. Co., Dayton, Ohio.
Detroit Steel Products Co., Detroit, Mich.
The Diamond Rubber Co., Akron, Ohio.
R. E. Dietz Co., New York, N. Y.
Firestone Tire & Rubber Co., Akron, Ohio.
The Fisk Rubber Co., Chicopee Falls, Mass.
G & J Tire Co., Indianapolis, Ind.
The B. F. Goodrich Co., Akron, Ohio.
The Goodyear Tire & Rubber Co., Akron, Ohio.
Gray & Davis, Amesbury, Mass.
C. T. Ham Mfg. Co., Rochester, Mass.
The R. E. Hardy Co., Detroit, Mich.
The Hartford Rubber Works Co., Hartford, Conn.
Herz & Co., New York, N. Y.
The Hess-Bright Mfg. Co., Philadelphia, Pa.
Hine-Watt Co., Chicago, Ill.
Hyatt Roller Bearing Co., Newark, N. J.
International Rubber Co., Milltown, N. J.
Janney-Steinmetz & Co., Philadelphia, Pa.
Phineas Jones & Co., Newark, N. J.

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The Jones Speedometer, New York, N. Y.
Light Mfg. & Fdry. Co., Pottstown, Pa.
Long Mfg. Co., Chicago, Ill.
The Manufacturers Foundry Co., Waterbury, Conn.
C. A. Mezger, New York, N. Y.
Midgley Mfg. Co., Columbus, Ohio.
Morgan & Wright, Chicago, Ill.
Motsinger Device Mfg. Co., Pendleton, Ind.
National Carbon Co., Cleveland, Ohio.
The New Process Rawhide Co., Syracuse, N. Y.
New York & New Jersey Lubricant Co., New York, N. Y.
New York Edison Co., New York, N. Y.
Oliver Mfg. Co., Chicago, Ill.
The Parish & Bingham Mfg. Co., Cleveland, Ohio.
Pennsylvania Rubber Co., Jeanette, Pa.
Pittsfield Spark Coil Co., Pittsfield, Mass.
The Prest-O-Lite Co., Indianapolis, Ind.
Rands Mfg. Co., Detroit, Mich.
Remy Electric Co., Anderson, Ind.
The Rose Mfg. Co., Philadelphia, Pa.
Salisbury Wheel & Mfg. Co., Jamestown, N. Y.
Shelby Steel Tube Co., Pittsburgh, Pa.
A. O. Smith Co., Milwaukee, Wis.
C. F. Splitdorf Co., New York, N. Y.
The Sprague Umbrella Co., Norwalk, Ohio.
The Springfield Metal Body Co., Springfield, Mass.
The Standard Welding Co., Cleveland, Ohio.
Strieby & Foote Co., Newark, N. J.
The Swinehart Clincher Tire & Rubber Co., Akron, Ohio.
Timken Roller Bearing Axle Co., Canton, Ohio.
Twentieth Century Mfg. Co., New York, N. Y.
Utility Co., New York, N. Y.
The Veeder Mfg. Co., Hartford, Conn.
Warner Gear Co., Muncie, Ind.
Warner Instrument Co., Beloit, Wis.
Webb Mfg. Co., Newark, N. J.
Weston-Mott Co., Utica, N. Y.
Whitlock Coil Pipe Co., Hartford, Conn.
Whitney Mfg. Co., Hartford, Conn.

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Winchester Speedometer Co., New York, N. Y.
Wray Pump & Register Co., Rochester, N. Y.

The charter membership list showed that about 22 per cent. of the companies were located in New York state and New Jersey; 24 per cent. in New England and 54 per cent. in the Middle West.

The first year list showed that the New York-New Jersey division, in which the manufacturing centers located in Pennsylvania, east of Pittsburgh are included, had increased in membership to 33 per cent. of the total, New England had 20 per cent. and Middle West about 47 per cent.

In 1905, H. W. Chapin, of the Brown-Lipe Gear Company, was elected president and the membership of the association reached 130. The territorial distribution of the companies represented was in about the same proportion shown in the list of the first year.

In 1906 Mr. Post was re-elected president and the net membership reported at the annual meeting was 173.

In 1907 H. S. White was chosen president. He represented the Shelby Steel Tube Company of Pittsburgh, Pa., and served for two years. The membership grew to 200 in his first year but was weeded down to 177 in 1908.

It was in 1907 that the association took on a very practical character, having demonstrated its value to the trade and removed its headquarters and executive offices to New York City. It had been located at Newark, N. J., and was operating under a Connecticut charter, but in January the Connecticut legislature granted a broader incorporation which allowed the association to increase and expand. The offices were located at 17 West Forty-second street, New York City, and William M. Sweet was employed to take charge of them under the title of assistant to the secretary.

In 1909 H. E. Raymond, B. F. Goodrich Company, was elected president and served for two years. The membership was 183 in 1909 and 232 the following year.

In 1911 H. T. Dunn of the Fisk Rubber Company was elected president and served two terms. The membership was 251 in 1911 and 263 in 1912.

In 1913 J. H. Foster, vice-president and general manager of the Hydraulic Pressed Steel Company, Cleveland, Ohio, was elected presi-

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dent, serving two years. The membership was 268 in 1913 and 255 in 1914.

In 1915 F. Hallett Lovell, president of the Lovell-McConnell Manufacturing Company, Newark, N. J., was elected president and after a thorough revision of the list the names of 234 active members remained.

This list, which represents the low mark of the year, includes the following:

1915 MEMBERSHIP

Ajax-Grieb Rubber Co., 57th Street and Broadway, New York.
The Aluminum Castings Co., Cleveland, Ohio.
American Ball-Bearing Co., Cleveland, Ohio.
American Bronze Co., Berwyn, Pa.
American Ever Ready Co., Thompson Avenue and Orton Street, Long Island City, N. Y.
American Gear & Mfg. Co., South Park Avenue, Jackson, Mich.
The American Hardware Corp., New Britain, Conn.
American Sheet & Tin Plate Co., Frick Bldg., Pittsburgh, Pa.
Apple Electric Co., 98 Warren Street, Newark, N. J.
Autocoil Co., 132 Seventh Street, Jersey City, N. J.
Automobile Supply Mfg. Co., 220 Taaffe Place, Brooklyn, N. Y.
The A-Z Company, 527 West 56th Street, New York, N. Y.
B. & R. Shock Absorber Co., 11 North 20th Street, Philadelphia, Pa.
The Badger Brass Mfg. Co., Kenosha, Wis.
The Baldwin Chain and Mfg. Co., Worcester, Mass.
The Batavia Rubber Co., Batavia, N. Y.
The Bearings Co. of America, Lancaster, Pa.
Benford Mfg. Co., Pearl Street, Mount Vernon, N. Y.
The Bigsby-Rotary Mfg. Co., 7500 Quincy Avenue, Cleveland, Ohio.
Bijur Motor Lighting Co., 250 West 54th Street, New York.
The Billings & Spencer Co., Hartford, Conn.
John W. Blackledge Mfg. Co., 2110 Michigan Avenue, Chicago, Ill.
E. W. Bliss Co., Adams and Plymouth Streets, Brooklyn, N. Y.
The Bock Bearing Co., Phillips Avenue & Michigan Central R. R., Toledo, Ohio.

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Bosch Magneto Co., 223 West 46th Street, New York.
The Bossert Co., Hickory Street, Utica, N. Y.
Bower Roller Bearing Co., Detroit, Mich.
S. F. Bowser & Co., Fort Wayne, Ind.
Breeze Carbureter Co., 250 South Street, Newark, N. J.
Briggs & Stratton Co., 258 Milwaukee Street, Milwaukee, Wis.
Briggs Mfg. Co., Post Office Station "F," Detroit, Mich.
Briscoe Mfg. Co., Detroit, Mich.
William H. Brown, 6536 Carnegie Avenue, Cleveland, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Brown-Lipe-Chapin Co., Seneca Street, Syracuse, N. Y.
Brown-Lipe Gear Co., 208 South Geddes Street, Syracuse, N. Y.
The Buda Co., Harvey, Ill.
Edward G. Budd Mfg. Co., 25th and Hunting Park Avenue, Philadelphia, Pa.
Byrne, Kingston & Co., Kokomo, Ind.
Carpenter Steel Co., Reading, Pa.
F. S. Carr Co., 113 Purchase Street, Boston, Mass.
Champion Ignition Co., Flint, Mich.
The Champion Machine & Forging Co., East 78th Street, Cleveland, Ohio.
The Chandler Co., Springfield, Mass.
L. C. Chase & Co., 89 Franklin Street, Boston, Mass.
The Cleveland Tanning Co., Denison Avenue and B. & O. R. R., Cleveland, Ohio.
Coes Wrench Co., 1 Coes Square, Worcester, Mass.
Columbia Nut & Bolt Co., Bridgeport, Conn.
The Connecticut Telephone & Elec. Co., Meriden, Conn.
Continental Motor Mfg. Co., Detroit, Mich.
Continental Rubber Works, Erie, Pa.
Corcoran Lamp Co., Cincinnati, Ohio.
Cotta Transmission Co., 814 South Main Street, Rockford, Ill.
Covert Motor Vehicle Co., Grand Street, Lockport, N. Y.
C. Cowles & Co., New Haven, Conn.
The Wm. Cramp & Sons Ship & Engine Bldg. Co., Beach and Ball Streets, Philadelphia, Pa.
The Crosby Co., Buffalo, N. Y.
Detroit Lubricator Co., Detroit, Mich.

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Detroit Pressed Steel Co., 1800 Mount Elliott Avenue, Detroit, Mich.

Diamond Chain & Mfg. Co., Indianapolis, Ind.

Jos. Dixon Crucible Co., Jersey City, N. J.

Doehler Die Casting Co., 187 West 9th Street, Brooklyn, N. Y.

Double Fabric Tire Co., Auburn, Ind.

Dover Stamping & Mfg. Co., 385 Putnam Avenue, Cambridge, Mass.

Dreadnaught Tire & Rubber Co., Munsey Bldg., Baltimore, Md.

The Duff Mfg. Co., Allegheny, Pa.

John L. G. Dykes Co., 222 North State Street, Chicago, Ill.

Dyneto Electric Co., 308 West Jefferson Street, Syracuse, N. Y.

Edison Storage Battery Co., Orange, N. J.

The Edmunds & Jones Mfg. Co., 432 Lawton Avenue, Detroit, Mich.

The Electric Auto-Lite Co., 133 Michigan Street, Toledo, Ohio.

The Electric Storage Battery Co., 19th Street and Allegheny Avenue, Philadelphia, Pa.

Empire Rubber & Tire Co., Clinton Avenue and Mulberry Street, Trenton, N. J.

Endurance Tire & Rubber Co., 1789 Broadway, New York.

The English & Mersick Co., 154 Winchester Avenue, New Haven, Conn.

Fafnir Bearing Co., Booth Street, New Britain, Conn.

Fedders Mfg. Works, 57 Tonawanda Street, Buffalo, N. Y.

Federal Rubber Mfg. Co., Cudahy, Wis.

The Ferro Machine & Foundry Co., 66th and Hubbard Avenue, Cleveland, Ohio.

Findeisen & Kropf Mfg. Co., 21st & Rockwell Streets, Chicago, Ill.

Firestone Tire & Rubber Co., Akron, Ohio.

The Fisk Rubber Co., Chicopee Falls, Mass.

The Forbes Varnish Co., Box 218, Cleveland, Ohio.

Gabriel Horn Mfg. Co., 970 Hamilton Street, Cleveland, Ohio.

Garage Equipment Mfg. Co., 742 South Pierce Street, Milwaukee, Wis.

The Garford Mfg. Co., Elyria, Ohio.

Gemmer Mfg. Co., Detroit, Mich.

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Gibney Tire & Rubber Co., 8th and Harry Streets, Conshohocken, Pa.

The Globe Machine & Stamping Co., Cleveland, Ohio.

Golde-Patent Mfg. Co., 509 West 56th Street, New York.

The B. F. Goodrich Co., Akron, Ohio.

The Goodyear Tire & Rubber Co., Akron, Ohio.

Gould Storage Battery Co., 30 East 42d Street, New York.

Grant-Lees Gear Co., 6901 Quincy Avenue, Cleveland, Ohio.

Gray & Davis, Boston, Mass.

The C. M. Hall Lamp Co., Hancock and Rivard Streets, Detroit, Mich.

L. P. Halladay Co., Streator, Ill.

Hancock Mfg. Co., Charlotte, Mich.

A. W. Harris Oil Co., 326 South Water Street, Providence, R. I.

Hartford Machine Screw Co., Hartford, Conn.

Hartford Suspension Co., 150 Bay Street, Jersey City, N. J.

Robert H. Hassler, West 10th and Canal Streets, Indianapolis, Ind.

George A. Haws, 142 Front Street, New York.

Hayes Mfg. Co., Detroit, Mich.

Hayes Wheel Co., Horton Street, Jackson, Mich.

Heinze Electric Co., Lowell, Mass.

Herz & Co., 245 West 55th Street, New York.

The Hess-Bright Mfg. Co., Front Street and Erie Avenue, Philadelphia, Pa.

The Hess Spring & Axle Co., Carthage, Ohio.

Hodgman Rubber Co., 806 Broadway, New York, N. Y.

The Hoffecker Co., Motor Mart, Park Square, Boston, Mass.

Holley Bros. Co., 668 Beaubien St., Detroit, Mich.

Hood Rubber Co., Watertown, Mass.

Houk Mfg. Co., 1700 Elmwood Avenue, Buffalo, N. Y.

T. P. Howell & Co., Corner New and Nuttman Streets, Newark, N. J.

Hyatt Roller Bearing Co., P. O. Box 476, Newark, N. J.

Hydraulic Pressed Steel Co., East 61st Street, Cleveland, Ohio.

The Imperial Brass Mfg. Co., Harrison Street & Centre Avenue, Chicago, Ill.

Interstate Foundry Co., Cleveland, Ohio.

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The "J. M." Shock Absorber Co., Inc., 210 South 17th Street, Philadelphia, Pa.

Janney-Steinmetz & Co., Philadelphia, Pa.

Phineas Jones & Co., 301 Market Street, Newark, N. J.

Kellogg Mfg. Co., 3 Circle Street, Rochester, N. Y.

Kelly-Springfield Tire Co., 229 West 57th Street, New York.

Atwater Kent Mfg. Works, 4937 Stenton Avenue, Philadelphia, Pa.

Kokomo Electric Co., 339 North Smith Street, Kokomo, Ind.

Leather Tire Goods Co., Niagara Falls, N. Y.

Lee Tire & Rubber Co., Conshohocken, Pa.

The Lefever Arms Co., Syracuse, N. Y.

Light Mfg. & Fdy. Co., Pottstown, Pa.

Link-Belt Co., Nicetown, Philadelphia, Pa.

Livingston Radiator & Mfg. Co., 75th Street and Amsterdam Avenue, New York.

Long Mfg. Co., 1283 Cass Ave., Detroit, Mich.

Lovell-McConnell Mfg. Co., Newark, N. J.

Lumen Bearing Co., 1155 Sycamore Street, Buffalo, N. Y.

McCord Mfg. Co., 2587 Grand Boulevard, Mich.

The McGraw Tire & Rubber Co., East Palestine, Ohio.

The Manufacturers Foundry Co., Waterbury, Conn.

Michelin Tire Co., Milltown, N. J.

Michigan Steel Castings Co., 248 Guoin Street, Detroit, Mich.

A. R. Mosler & Co., P. O. Box "M," Mount Vernon, N. Y.

The Motor-Compressor Co., 52 Dickerson Street, Newark, N. J.

Motsinger Device Mfg. Co., Lafayette, Ind.

National Carbon Co., Cleveland, Ohio.

National Coil Co., Michigan Avenue, E., Lansing, Mich.

National Lead Co., 111 Broadway, New York.

The National Screw & Tack Co., 7413 Stanton Avenue, Cleveland, Ohio.

National Tube Co., Pittsburgh, Pa.

The New Departure Mfg. Co., North Main Street, Bristol, Conn.

New Haven Clock Co., New Haven, Conn.

New Jersey Car Spring & Rubber Co., Wayne and Brunswick Streets, Jersey City, N. J.

New Process Gear Corp., Syracuse, N. Y.

N. Y. & N. J. Lubricant Co., 165 Broadway, New York.

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DAVID J. POST

First President Motor and Accessory Manufacturers. Veeder Manufacturing Company.

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HENRY WINFIELD CHAPIN

Brown-Life-Chapin Company. Second President Motor & Accessory Manufacturers.

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New York Edison Co., Irving Place & 15th Street, New York.
The Noera Mfg. Co., Waterbury, Conn.
The Nokolyd Signal Co., 40 West 13th Street, New York.
North East Electric Co., 348 Whitney Street, Rochester, N. Y.
Overman Tire Co., Inc., 250 West 54th Street, New York.
The Pantasote Co., 11 Broadway, New York.
The Parish & Bingham Co., Cleveland, Ohio.
Parish Mfg. Co., Reading, Pa.
Pennsylvania Rubber Co., Jeannette, Pa.
The Perfection Spring Co., Central Avenue, Corner East 65th Street, Cleveland, Ohio.
Pittsburgh Model Engine Co., Lexington & P. R. R., Pittsburgh, Pa.
Pittsburgh Steel Products Co., Frick Annex, Pittsburgh, Pa.
Polack Tyre & Rubber Co., 246 West 59th Street, New York.
The Portage Rubber Co., Barberton, Ohio.
The Prest-O-Lite Co., Indianapolis, Ind.
Racine Mfg. Co., Cor. Sixth & Mead Streets, Racine, Wis.
Racine Rubber Co., Racine, Wis.
Rands Mfg. Co., Detroit, Mich.
Remy Electric Co., Anderson, Ind.
The Republic Rubber Co., Youngstown, Ohio.
The Roessler & Hasslacher Chem. Co., 100 William Street, New York, N. Y.
The Rose Mfg. Co., 911 Arch Street, Philadelphia, Pa.
Ross Gear & Tool Co., Corner Main and Ninth Streets, Lafayette, Ind.
The Royal Equipment Co., 414 Housatonic Avenue, Bridgeport, Conn.
Russel Motor Axle Co., North Detroit, Mich.
J. H. Sager Co., Rochester, N. Y.
Salisbury Wheel & Mfg. Co., Jamestown, N. Y.
A. Schrader's Son, Inc., 783 Atlantic Avenue, Brooklyn, N. Y.
The Schwarz Wheel Co., Mint-Arcade Bldg., Philadelphia, Pa.
C. A. Shaler Co., Waupun, Wis.
Sheldon Axle & Spring Co., Wilkes-Barre, Pa.
Sherwin-Williams Co., 601 Canal Road, N. W., Cleveland, Ohio.
The Simms Magneto Co., East Orange, N. J.
The Sireno Co., Inc., 18 Rose Street, New York.

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A. O. Smith Co., Milwaukee, Wis.

The F. W. Spacke Machine Co., Madison, Merrill and Pennsylvania Streets, Indianapolis, Ind.

The Sparks-Withington Co., North Street, Jackson, Mich.

Spicer Mfg. Co., Madison & West 3d Streets, Plainfield, N. J.

Splitdorf Electrical Co., 98 Warren Street, Newark, N. J.

The Springfield Metal Body Co., Springfield, Mass.

Standard Thermometer Co., 65 Shirley Street, Boston, Mass.

The Standard Tool Co., 6918 Central Avenue, Cleveland, Ohio.

The Standard Welding Co., Cleveland, Ohio.

The Steel Products Co., 2216 Clarkwood Road, Cleveland, Ohio.

Stewart-Warner Speedometer Corp., 1826 Diversey Boulevard, Chicago, Ill.

Strieby & Foote Co., Newark, N. J.

Stromberg Motor Devices Co., 64 East 25th Street, Chicago, Ill.

Sulzberger & Sons Co., 41st Street and Ashland Avenue, Chicago, Ill.

The Swinehart Tire & Rubber Co., Akron, Ohio.

Taylor Instrument Companies, Rochester, N. Y.

The Timken-Detroit Axle Co., 132 Clark Avenue, Detroit, Mich.

The Timken Roller Bearing Co., Canton, Ohio.

Tyer Rubber Co., Andover, Mass.

Union Drawn Steel Co., 460 Washington Street, New York.

The United States Light & Heating Co., Niagara Falls, N. Y.

The United States Rubber Co., 1790 Broadway, New York.

Vacuum Oil Co., Rochester, N. Y.

Valentine & Co., 456 Fourth Avenue, New York.

Vanadium Metals Co., Frick Bldg., Pittsburgh, Pa.

The Van Sicklen Co., 58 South River Street, Aurora, Ill.

E. B. Van Wagner Mfg. Co., Drawer No. 47, Syracuse, N. Y.

The Veeder Mfg. Co., Hartford, Conn.

Vesta Accumulator Co., 2100 Indiana Avenue, Chicago, Ill.

Volute Spring Shock Absorber Co., Mount Vernon, N. Y.

Voorhees Rubber Mfg. Co., 18 Bostwick Avenue, Jersey City, N. J.

Wagner Electric Mfg. Co., 6400 Plymouth Avenue, St. Louis, Mo.

Waltham Watch Co., Waltham, Mass.

Ward Leonard Electric Co., Bronxville, New York.

Warner Gear Co., Muncie, Ind.

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Warner Mfg. Co., Central Avenue, Toledo, Ohio.
Waukesha Motor Co., St. Paul Avenue, Waukesha, Wis.
Weed Chain Tire Grip Co., Bridgeport, Conn.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Weston-Mott Co., Flint, Mich.
Wheeler & Schebler, Indianapolis, Ind.
Whiteley Steel Co., Muncie, Ind.
Whitney Mfg. Co., Hartford, Conn.
The Willard Storage Battery Co., Cor. Marquette Road and Lakeside Avenue, Cleveland, Ohio.
J. H. Williams Co., Hamilton Street, Brooklyn, N. Y.
Wolverine Lubricants Co., 80 Broad Street, New York.
The Zenith Carburetor Co., Foot of Vanda Avenue, Detroit, Mich.

Comparing the charter membership and the 1904 list with the 1915 record, it is proven that 62 per cent of the charter members retain their connection with the association after eleven years, and a fraction over 58 per cent. of the concerns that joined the society during its first year are still members under the same business style as when they entered the association. A careful scrutiny of both lists reveals the fact that only 8 per cent. of the first year members have been eliminated from active participation in the association. Owing to consolidations, expansions and changes in firm and corporate designations, the interests that were affiliated with certain companies, the names of which do not appear in the current list, are still in the organization, accounting for the wide difference noted.

It is a significant fact that after such a considerable period of time it should be found that only 8 per cent. of the original members of a trade organization had dropped out of it.

A territorial analysis shows that the New York-New Jersey group represents 38 per cent. of the membership; New England 11 per cent., and the Middle West 51 per cent.

There are 26 manufacturers of tires included in the list.

At the beginning of 1915 it was estimated that the total capitalization represented in the association was somewhat in excess of $500,000,000.

In 1915 the activities of the association were chiefly conducted in departments as follows: Credit, Trade Information, Traffic, Legislative, List and Statistical and Show Departments.

At first the principal work of the association was with regard to

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the first two named above, but in the course of time the others were added and two departments that were installed during the first five years of the association have been dropped. The List and Statistical Department was added during 1915.

The Credit Department maintains a compact and efficient system for collecting and disseminating the credit experiences of members with automobile manufacturing companies and also with firms, individuals and corporations not connected with automobile manufacturing. Reports on the automobile companies are made to the members at regular periods and on other concerns at the request of members. The manager of the department gives his opinion on the credit in question.

In service it has been found that the Credit Department saved a profitable sum for the members each year, and that it was always busy from the moment of its installation. Some idea of its importance can be gathered from the fact that during the period of mushroom growth in the car-making industry, credits generally were much expanded, and in one year the failures of automobile manufacturers averaged one per week.

The Trade Information Department is a bureau maintained to secure private and confidential information for members about marketing conditions. It does research work and has been highly commended for preventing several serious potential mistakes by members. To some extent it is similar in its scope to the Credit Department, but with less breadth. It is the least important department of the association.

The Traffic Department allows members the privilege of information and advice on receiving and shipping, rates and classifications. It checks freight bills; makes claims for overcharges and collects them from the carriers. The department suggests routes, methods of packing, and gives information about proper description of freight on bills of lading, so that proper classification of the shipment may be made.

The Legislative Department formerly included a legal section, which has been eliminated from its activities. As constituted in 1915, the department simply collects for reference purposes, copies of all proposed state and national laws touching on the interests of members in any way. The industry has been subjected to an enormous mass of misdirected attempts to hamper it by statute. Jealousy and ignorance of the automobile, reckless operation in many cases, disregard

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of the rights of others by motorists and the general public, and the eternal striving of many legislators to strike a popular note by riding on the crest of a popular wave, caused to be presented to state and national legislatures a collection of proposed laws that, viewed in the aggregate, make the practices of the Spanish Inquisition seem like the judgments of Solomon.

The spectacle of a drunken or simply exhilarated driver operating a car is not edifying, and the reckless operator is decried more strenuously in the automobile industry than anywhere else. But it is doubtful if the various tire-dating bills introduced from time to time in several states would serve to check a single aggressive act of recklessness. Or, in fact, make delivery in a constructive sense of a single mile of extra tire service. Any bill introduced which, if enacted, might tend to restrict the use of automobiles in an illegal and unconstitutional and unjust manner, is deemed to be a hostile blow at the whole industry. As a result of the drawing of the lines, in an effort to prevent ignorant, piratical, unthinking or simply useless laws, the industry has often gone to the other extreme, and in times past frequently has been obliged to fight legislation that really possessed constructive features.

The service of the legislative department is bounded by the collection of proposed bills and supplying copies to those members adversely affected. When it is fully understood that automobile operation at four miles an hour may be the height of recklessness under certain conditions and that thirty-five miles an hour is perfectly safe and sane under others, and that prosecution under the homicide law is barred by the presumptions of legality contained in most of the state laws which provide for a certain speed limit in miles per hour, where it can be proven that the speed limit was not reached; while a pace in excess of the legal limit is given an undue importance in court proceedings, something of the importance of the departmental work becomes apparent, despite the fact that speed regulation only affects the parts makers indirectly.

Within a measureable period the Legislative Department will decrease in importance and will probably be discontinued when the general public has become educated up to the automobile and when motorists have accepted the fact that the public has certain well-defined rights. But in the pioneer days when some foolish law might

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have crippled the whole industry in some such similar fashion as the law-makers in England put a full stop to the progress of the early steam automobiles in 1831 by allowing regulations that made operation impossible, the department did valiant service.

The List and Statistical Department is the latest work to be taken up by the association. For a long time the directors worked on the plans for this department before finally adopting the idea, which in some ways ranks among the most interesting branches of the association's work. The idea was to compile and classify the distributing trade and owners of cars so as to provide authentic and official lists for use in marketing the product of members.

In working out the plan it was found that there are something over 50,000 garages and accessory dealers in the country who buy accessories for resale and who have established places of business. These have all been carefully listed so that any section of the country, state, county or city, can be covered without reference to any other section, if desired. In addition to the accessory dealers and garages, 25,000 car dealers and agents have been listed and classified—6,000 truck dealers, 14,000 dealers in motorcycles, and 10,000 bicycle dealers. The whole trade has been treated along similar lines as those covered in handling the accessory dealers so far as classification is concerned.

For the convenience in direct marketing to individual automobile owners and affiliated classes, lists of owners (1915) approximating 2,250,000 motorists and 85,000 motorcycle owners have been compiled and other lists are in contemplation, separating the active motorists into classes divided on the lines of the type of cars owned by each.

The department addresses mailing envelopes for members, inserts advertising matter or announcements of any kind, and handles the whole laborious transaction without reference to the member, if it is desired. Or it returns the addressed envelopes to the member ordering them, thus placing an unquestionable list of customers and prospective customers in the hands of members.

So many abuses grew up with the industry in the way of loose, slipshod and some actual swindling lists that the new department of the association met with a hearty reception and grew into immediate importance.

The Show Department of the association is affiliated with the

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department of the national organization of car makers, and while it does not exploit show benefits specifically, it recognizes them, and, through the co-operation of the association with the national automobile shows it is able to secure choice spaces in the shows and other advantages. The annual banquet of the association during show week in New York has been the leading social feature of the automobile industry for many years.

The experience of the industry shows that a real constructive work has been done by the association. Its officers and directors always have been chosen from among the highest types of men engaged in the industry. Their labor, services, prestige and talents have been freely donated to the good of the association and the great industry it represents.

William Montgomery Sweet, manager, was employed by the society in 1907. He was given the title of manager in 1910 and has had direct charge of the various departments and activities under the rule and instruction of the directors. He has gained a deeper knowledge and wider acquaintance in the trade than that possessed by any other one man and is considered the prime authority on a dozen different trade subjects.

Mr. Sweet's adaptability may be illustrated by the part he has taken in carrying out the ideas of the show and banquet committees, and with regard to the latter it may be said that for sheer excellence, variety and talent, the entertainment arranged by Mr. Sweet for the annual banquet indicates either an astonishingly intimate acquaintance with stage personalities, or an equally astonishing influence with booking agencies.

The complete roster of officers for 1915 follows:

Term Expires	
1916	President—F. Hallett Lovell, Jr., Lovell-McConnell Mfg. Co., Newark, N. J.
1917	First Vice-President—C. W. Stiger, Stromberg Motor Devices Co., Chicago, Ill.
1916	Second Vice-President—C. E. Thompson, The Steel Products Co., Cleveland, Ohio.
1917	Third Vice-President—T. J. Wetzel, The Dyneto Electric Co., 33 West 42d Street, New York.

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1918 Treasurer—L. M. Wainwright, The Diamond Chain & Mfg. Co., Indianapolis, Ind.
1916 Secretary and Assistant Treasurer—Alfred P. Sloan, Jr., Hyatt Roller Bearing Co., Newark, N. J.
1917 James H. Foster, Hydraulic Pressed Steel Co., Cleveland, Ohio.
1917 H. E. Raymond, The B. F. Goodrich Co., 1780 Broadway, New York.
1916 C. E. Whitney, The Whitney Mfg. Co., Hartford, Conn.
1918 E. H. Broadwell, The Fisk Rubber Co., Chicopee Falls, Mass.
1918 E. W. Beach, Manufacturers Foundry Co., Waterbury, Conn.
1918 Christian Girl, The Perfection Spring Co., Cleveland, Ohio.

AMERICAN AUTOMOBILE ASSOCIATION

Protecting the user of the motor car with the shield and buckler of its mass and numbers and encouraging the manufacturer of automobiles to develop his product by clearing the road for the use of the car, the American Automobile Association has had a prominent part in bringing about the vogue of the automobile.

It stood as a barrier against aggression by predatory legislators and public ignorance at a time when such protection was as necessary as the ring of sentries surrounding a regiment of exhausted troops. It held in control and educated its own members to an understanding not only of the laws, but also of the rights of the public not definitely expressed in the statutes. It frowned upon recklessness. It encouraged constructive things. It fostered the spirit of sport. It accepted the administration of the great speed and reliability contests that have done so much to improve the character of the modern car.

"Three A's" as a whole has earned a place in automobile history.

It is composed of a band of motorists, nearly all of whom are members of clubs affiliated with the national body. The clubs in turn are practically all members of state organizations, and the system of government is patterned after our national government.

The various bodies of motorists are represented on the national boards and all have a voice in the management of the central organization. That the foregoing is simply and unequivocally true is proven

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by the sharp debates that have always marked the history of the association and the upheavals noted from time to time in its records.

The activities of the A. A. A. are divided chiefly into four groups, although in fact they comprise several others. These major divisions are as follows: Good Roads, Touring Information, Legislative, and Contests.

The achievements of the association in all four directions have been notable. The automobile was born into a world that was almost roadless. It is solely and entirely accountable for full 90 per cent. of the improved roads in the United States in 1915, and the American Automobile Association, as the national organization of the automobile user, bore a chief part in bringing that condition to pass.

Touring always has been an important part of automobile service. Perhaps it was more important in the years gone by than it is now, but it is still a factor to be reckoned with. The association has maintained for years a map department; has employed scouts to discover and make records of the best routes and has widely disseminated information among its members. Touring, it may be noted, is one means of keeping the car in use. Cars have only a certain number of miles to deliver, and when their mission is finished they are nearly always replaced, providing the service rendered has been satisfactory to the owner. Therefore: Touring, from the viewpoint of the manufacturer, is an excellent constructive thing.

In the field of legislation, the association from the first has been a leader in the fight for fair treatment for the motorist. British history tells of the destruction of the whole fabric of the early steam-propelled road-vehicles by the enactment and enforcement of discriminatory laws that made the operation of such vehicles impossible. And when the early gasoline cars came along in some numbers in 1902, a mass of fearsome legislation sprung up almost overnight. The Legislative Board of the American Automobile Association was the backbone of the organization for a dozen years, and the necessity for the board is well indicated in the first outline given of the objects of the association by President Winthrop E. Scarritt, which read as follows:

First: The securing of rational legislation.

Second: The formation of proper rules governing the use of the automobile.

Third: To protect the interests of automobilists against unjust discrimination.

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Fourth: To maintain their lawful rights and privileges.

Fifth: To encourage the use of the automobile and its development.

Sixth: To promote the "Good Roads" movement.

The first four objects mentioned come properly within the scope of the Legislative Board, and the other two were merely broad generalizations.

The Contest Board of the A. A. A. developed into the official sport-governing body of American motordom soon after speed and reliability contests became popular. During the formative period of the industry it conducted, managed and sanctioned the national speed and reliability contests for the Vanderbilt Cup and the Glidden Trophy. For ten years the board has been supreme in its field. No contest can be staged without its consent, if it be an event of importance. As a general thing, its rules have been fairly administered and its effort has been solely directed toward clean sport.

In addition to these main activities, the association publishes a monthly periodical, *The American Motorist,* and co-operates with the national and trade organizations to correct specific conditions.

The formation of the association was the result of the failure of the Automobile Club of America and numerous outside organizations to bring about a national body. Efforts were made prior to 1902 to frame an organization of national scope to afford protection to the growing body of motorists. At that stage of the new fad, motordom was a vulnerable thing. The car was called the plaything of the rich and quite a material fraction of the public was undeniably hostile.

Lawmakers seeking public notice legitimately, lawmakers who sought it illegitimately, lawmakers who wished to conceal a joker, lawmakers who followed the tactics of the cuttlefish and desired to shroud real purposes within a cloud of their own exudation, all took a hack at the motorists. There was a very real reason for the formation of the American Automobile Association.

March 4, 1902, delegates from nine clubs met in Chicago and formed the American Automobile Association. These clubs and their delegates were as follows:

Chicago Automobile Club, F. C. Donald and E. F. Brown.
Automobile Club of America, A. C. Bostwick and W. E. Scarritt.
Automobile Club of New Jersey, W. J. Stewart and W. F. Harris.

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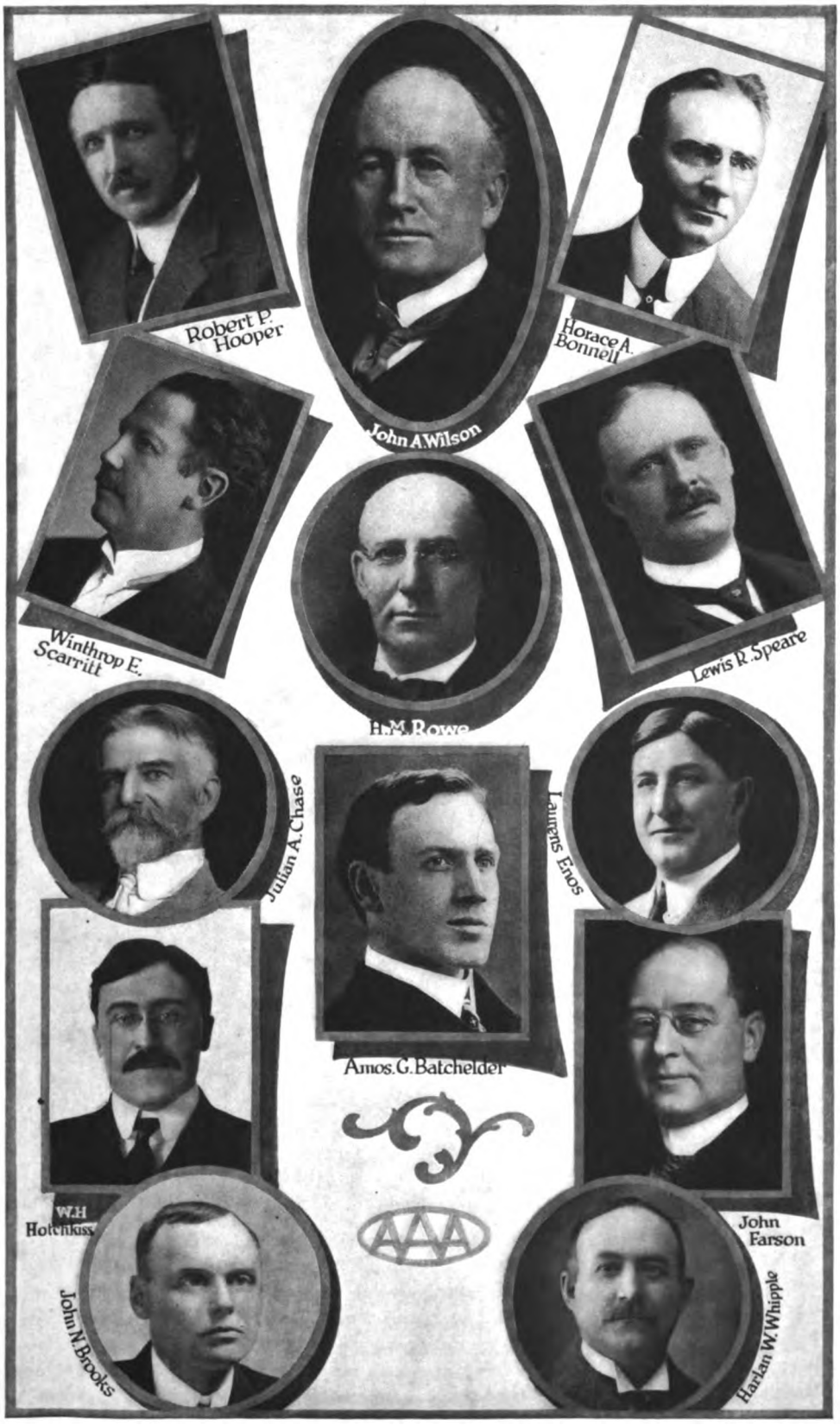

PIONEERS AND OFFICERS OF THE AMERICAN AUTOMOBILE ASSOCIATION

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Long Island Automobile Club, F. G. Webb and Edwin Melvin.
Rhode Island Automobile Club, H. H. Rice and W. J. Titcomb.
Philadelphia Automobile Club, F. C. Lewin.
Princeton University Automobile Club, C. H. Gugro.
Automobile Club of Utica, S. C. Mott.
Grand Rapids Automobile Club, Walter Austin and C. B. Judd.

Messrs. Webb, Brown, Austin and Lewin were named as a committee on organization and constitution by Temporary Chairman F. C. Donald, and Messrs. Bostwick, Stewart, Titcomb, Mott and Judd were named as a committee on plan and scope and co-operated with the other committee in building the foundation of the association.

On March 5, 1902, the following officers were selected:

President: Winthrop E. Scarritt.
First Vice-President: F. C. Donald.
Second Vice-President: W. W. Grant.
Third Vice-President: W. G. Morris.
Treasurer: Jefferson Seligman.
Secretary: S. M. Butler.

Directors: F. G. Webb and A. R. Pardington, Long Island Automobile Club; A. R. Shattuck, Automobile Club of America; W. J. Stewart, Automobile Club of New Jersey; F. C. Lewin, Automobile Club of Philadelphia, and Dr. J. A. Chase, Rhode Island Automobile Club.

Headquarters were established in the rooms of the Automobile Club of America and at a meeting held on April 1 the objects of the association were presented by President Scarritt as stated above. It was deemed necessary to expand the workings of the association and committees were authorized which were perfected and reported at the meeting May 6, as follows:

Racing, W. J. Stewart; Legislative, Jefferson Seligman; Technical, Dr. Chase; Membership, F. C. Donald; Highways, Frank G. Webb, and Auditing, Frank C. Lewin.

The first application for a racing sanction was made by a group of individuals who proposed to hold a meeting at the Brighton Beach race track, June 21. It was refused on the ground that sanctions could only be granted to duly organized automobile clubs. A. R. Pardington and H. B. Brazier were appointed to the racing board.

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At the time of the first annual meeting of the association, nine clubs appeared as full members, but the list included the name of the Cleveland Automobile Club, represented by Windsor T. White, and failed to mention the Princeton University Automobile Club. This meeting was held at the Automobile Club of America, January 20, 1903.

In President Scarritt's report the following interesting comment is made:

"We should see to it that the shameful waste of public moneys in building our so-called 'highways' shall cease. The United States government has shown by carefully prepared statistics that the loss on account of our poor roads would, within three years, rebuild in the most substantial manner every highway in the United States. Surely there is a field of endeavor full of promise. Most of the highways in our country to-day are a disgrace to our boasted civilization. The bicycle has done much for good roads; the automobile should do vastly more. We congratulate the association on the outlook for the coming year. It is estimated that 35,000 automobiles will be sold in 1903. Our numbers are increasing in geometrical progression. The automobile is rapidly becoming one of the great factors in our modern life."

It was reported that there were 43 automobile clubs in the country and that five more were in process of formation at the time of the meeting.

The roster of officers for 1903 carried the following names:

President: Dr. Julian A. Chase, Rhode Island Automobile Club.

First Vice-President: Honore Palmer, Chicago Automobile Club.

Second Vice-President: E. Shriver Reese, Cleveland Automobile Club.

Treasurer: Harlan W. Whipple, Automobile Club of America.

Secretary: S. M. Butler, Automobile Club of America.

Directors: W. E. Scarritt, Frank G. Webb, A. R. Pardington, W. E. Milbank, W. J. Stewart, Frank C. Lewin and Max C. Fleischmann.

The chairmen named for the six main committees were: Racing, W. J. Stewart; Membership, S. A. Miles; Technical, E. B. Gallaher; Highways, Frank G. Webb; Legislative, W. E. Scarritt, and Auditing, Frank C. Lewin.

On June 2 A. R. Pardington succeeded Mr. Stewart as head of

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the Racing Committee. At the January session Mr. Pardington reported that W. K. Vanderbilt, Jr., had agreed to donate a cup to be awarded as a prize to the winner of a long-distance road race.

The second annual meeting was held in the Coliseum, Chicago, February 11, 1904.

At that time the association numbered 22 clubs and associations and had individual memberships amounting to 96.

The plan for securing the membership of individuals originated with Frank G. Webb during the previous year and met with instant recognition. A plan providing for a division of the annual dues and initiation fees of the New York State Automobile Association was perfected, so that the work of both the national and state bodies was facilitated. The association went on record at the annual meeting as favoring the idea of state associations of automobile clubs and endorsed the plan of forming such an association in Massachusetts.

About this time there was a general movement all over the country to join hands with the association and coincidentally the Long Island Automobile Club passed a resolution extending the privileges of the club and garage to members of the association generally and the association took up and discussed the idea of reciprocal club privileges. The plan was favored by several of the large and important clubs.

A tour under the auspices of the association, to end at St. Louis, was authorized to take place during the summer. Harlan W. Whipple, of the Automobile Club of America, was chosen president, and C. H. Gillette secretary.

In the spring of 1904 an effort was made to merge and consolidate the American Motor League, a pioneer organization of individual motorists, with the American Automobile Association, but, owing to the fact that a single delegate representing a club in the latter organization was empowered to cast the full vote of the club at any meeting, the league declined to amalgamate.

July 6 the deed of gift by which William K. Vanderbilt, Jr., presented the Vanderbilt Cup to the association was accepted, and on November 8 the Charles J. Glidden trophy for touring reliability was also accepted, thus giving the association two magnificent prizes to be awarded in competition, one for road speed and the other for service reliability. These two trophies have served to do more for the mechanical improvement of the automobile than any other American automobile prizes. In several years the winning of either of them served

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to give the successful manufacturer official and unofficial publicity worth many thousands of dollars.

The Vanderbilt Cup is not limited to the competition of stock cars and always has brought forward advanced ideas in engineering, while the Glidden Trophy has been sought by stock cars, as a general thing. It may be said that the Vanderbilt Cup was for testing and proving new ideas, not incorporated in the manufacture of the year in which the race was run, while the Glidden Trophy was for the same kind of car that any customer might buy during the year in which the tour was run or the next.

Mr. Whipple and the whole ticket of officers of 1904 were re-elected at the third annual meeting of the association, which was held at the Hotel Seville, New York City, but President Whipple tendered his resignation at the succeeding meeting of the directors and it was accepted. Eliot C. Lee was unanimously elected to the presidency.

In racing matters there was a shake-up, Mr. Pardington resigned as chairman and was succeeded by W. C. Temple, of the Pittsburgh Automobile Club. Mr. Temple only held the post for a short time and retired in favor of Robert Lee Morrell.

Upon the resignation of Mr. Gillette, A. G. Batchelder, who was destined to become one of the leading men in motordom, was elected secretary, while Lewis R. Speare, of Boston, later to be the head of the association, at what was perhaps its period of greatest importance; Robert P. Hooper, of Philadelphia, whose administration as president marked the golden era of the organization, and a number of other motorists whose names are now known wherever the automobile is commonly used, began to take prominent places in the councils of Three A's.

Mr. Speare was chosen Vice-President in 1906, when John Farson, of Chicago, was named as president at the fourth annual meeting of the society, held at the First Regiment Armory, Chicago, on February 8. Sidney S. Gorham, since rated as one of the leading legal minds in the country with regard to automobile legislation, was elected secretary and head of the Legislative Board. Paul Deming, of Detroit, headed the Touring Committee; J. D. Thompson, of the Automobile Club of America, the Racing Board, and Robert P. Hooper, of Philadelphia, the Good Roads Committee.

January 17 and 18, 1907, the fifth annual meeting of the association was held at the new club house of the Automobile Club of

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America, and William H. Hotchkiss was elected president, while Lewis R. Speare moved up into the first vice-presidency. Frederick H. Elliott was chosen secretary. At that time the association had grown to include in its membership five state associations, twenty-three non-affiliated clubs and 267 individual members. The state associations represented 48 clubs, and the total membership was reported as 8,857. It was in this year that the bureau of touring information was formed and the first serious attempt to reach a basis for uniform motor vehicle legislation was made. The April meeting of the directors was held at 437 Fifth Avenue, New York.

The same officers as were elected in 1907 served in the following year, and, save for the dropping out of Asa Paine of the Florida East Coast Automobile Association, who had served two terms as second vice-president; the moving up of Ira M. Cobe of Chicago and election of Frank M. Joyce as third vice-president, the only significant change in the roster of 1909 was the addition of Horace A. Bonnell as treasurer, a post held by him for seven successive years. Mr. Hotchkiss resigned as president during the year and Mr. Speare filled the office.

Powell Evans, of Philadelphia, who had been made chairman of the Touring Board in 1908, installed a number of radical improvements and enlargements that proved to have an excellent effect not only upon touring and international relations, but also upon membership of the association. Mr. Evans, a manufacturer of much importance to the automobile industry, devoted his time, labor and energy to this work with marked success.

In 1909, the Contest Board, with which had been merged the Technical Board, assumed full charge of sanctioning all kinds of contests. This action was taken at the request of the Manufacturers' Contest Association, the situation with regard to contests having grown complex, due to the tremendous scope of the problems propounded by the definition of a stock car.

The American Motorist was launched in April and soon had a circulation of 30,000, which was something less than the total membership of the association at that time.

The eighth annual meeting of Three A's was held at the Hotel Belmont, New York, November 30, 1909, and Lewis R. Speare was chosen president; Robert P. Hooper, first vice-president; Frank M. Joyce, second vice-president; W. C. Donald, third vice-president. Mr. Bonnell was re-elected treasurer. A. G. Batchelder was chosen

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chairman of the Executive Committee and general manager of the *American Motorist*. S. M. Butler was appointed chairman of the Contest Board and later in the year Robert Bruce was chosen secretary. Chairman Evans of the Touring Board put into effect several of his innovations and the association as a whole grew rapidly throughout the year.

President Speare gave the association a thorough reorganization in every department, so that at the end of the year Three A's was abreast of the industry, despite the changes in basic conditions that had been kaleidoscopic in their character during each of the five preceding years.

One of the really significant things that happened during the year was the promulgation of a complete set of contest rules, providing among other things that before stock cars could compete in contests, as such, the manufacturers would have to file sworn certificates with the Contest Board, describing the mechanical details of the cars. C. T. Terry, chairman of the Legislative Board, drafted a bill which was submitted to Congress, providing for Federal registration of automobiles in interstate commerce. This measure was given a respectful hearing before the House Committee on Interstate and Foreign Commerce. This hearing was the culmination of the National Legislative Convention held by the association in Washington during February.

The bill in question, while never enacted, proved to be a landmark and beacon light for numerous sane regulations proposed, introduced and enacted in various states since that time. It proposed a single national registration for cars used to cross state lines, in place of the varying and sometimes onerous state registrations.

George C. Diehl, of Buffalo, head of the Good Roads Board, had a very active and successful year, and for the first time in the history of the country the general character of the rural roads, particularly in the East, improved notably.

In 1911 Robert P. Hooper assumed the presidency and was re-elected in 1912. During Mr. Hooper's two terms the association extended to all the corners of the country and the membership increased remarkably. The welding together of motorists into a concrete body, respresenting fully 90 per cent. of the taxable wealth of the country, was the main object in view, and under Mr. Hooper the association went a long way toward accomplishing that end. The effect was noticeable in the extension of good roads, but was much

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more apparent in the change of attitude toward motordom on the part of various legislatures.

A number of momentous things took place during Mr. Hooper's administrations, some of which really had their inception previous to his installation.

In the first place, the Glidden Tour of 1910, run under stringent rules to establish the "stock" status of the contesting cars, resulted in a dispute that was carried into the civil courts and naturally engendered some bitter feelings. The conclusion of this matter came during Mr. Hooper's presidency, and that the results were no more serious is a distinct tribute to the diplomacy of Mr. Hooper and his associates.

In the fall of 1911, during the running of the Glidden Tour from New York to Jacksonville, Fla., Chairman Samuel M. Butler, of the Contest Board, an official of the tour, was killed in an accident by which the car in which he was riding turned over near Valdosta, Ga. Mr. Butler was one of the pioneer motorists of America—a keen sportsman; careful and intelligent official, and considered the prime authority of the country on automobile contests of all sorts.

Another incident was the definite conclusion that stock car contests could not be staged satisfactorily, owing to the cumbersome procedure necessary to insure the stock status of the cars competing. Only one company filed the necessary certificates in 1911 to allow its product to compete in the stock classes. Since then the response of the automobile manufacturers to the requirements for sworn certification of their regular models has been scanty.

The great annual tours for the Glidden and other trophies were of the utmost importance to the industry, but when the stage of mechanical perfection had been reached where any automobile would run almost anywhere and back again, the fundamental reason for them, from the viewpoint of the manufacturer, ceased to exist. There will always be tours which have the amusement and recreation of car owners for their main purpose, but the day of the great technical tour is finished, because its purpose is exhausted.

In this view of the subject, a word of appreciation of the foresight of Charles J. Glidden and his liberality in donating the premier touring prize of America will not be out of place.

Mr. Glidden, a very wealthy and progressive Bostonian, took up motoring for pleasure soon after the first cars made their appearance in this country. Long before the real vogue of the automobile com-

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menced, he owned cars and used them widely. In about eight years Mr. Glidden literally traveled all over the world. He was in position early in the pioneer days to realize that the first cars were cranky and delicate and that when the owner drove slight mechanical mishaps might prove quite as serious as a collision with a railroad train or any other accident through which the car might be utterly destroyed.

The dropping out of a cotter-pin, leading to the stalling of the car in a wilderness, might prove quite as fatal to everybody concerned as a plunge over a precipice.

Having adopted that idea, Mr. Glidden sought to find a means of correcting the condition, and the result was the presentation of the Glidden Trophy.

For years it was awarded annually to the contestant, team or individual car, that made the most perfect reliability score under the contest rules of the American Automobile Association. The whole object, from the viewpoint of the manufacturer, was to prove to the public that his product compared favorably with that of other makers. As the competing cars were stock or substantially stock product, the tours gave the public a distinct insight into their relative excellence, or the opposite.

The conditions were always so severe that perfect scores meant good engineering and good material, even though bad luck and poor driving had to be given due consideration, and allowances had to be made for their opposites. The result was that while it required the highest priced cars to win one of the early tours, the latter ones were won by machines of more moderate price and the last few that were contested developed winners in the medium and cheap classes. Certainly the conditions of the tours and the roads were quite as severe in recent years as they were when the early contests were staged, and yet the proportion of cars that finished in 1911 and 1913 was much higher than in early years, while their price was much less on the average.

The Vanderbilt Cup undoubtedly encouraged speed, but the Glidden Trophy stands for touring reliability, which includes a high degree of road speed.

At the conclusion of Mr. Hooper's administration of the association, the widespread opposition to the automobile that had marked the beginning of its use had disappeared from public view. Any automobile of current manufacture would run. The degree of mechanical

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excellence had been reached where the car was in reality a useful factor in the daily life of the nation. Everything detrimental possible had been done that could be done to check the growth of motoring, and it had survived all the shocks and had expanded from a fad to a necessity.

Laurens Enos of Buffalo was elected to the presidency in 1913. The administration of Mr. Enos marked the commencement of a new phase in the development of the automobile. It was not now necessary for motorists to fight for simple rights guaranteed by the basic law, any more than it was necessary for them to spend any material amount of time on their backs under their cars.

Manifestly the time had come for some aggressive constructive action to put sound laws on the statute books and focus energy and attention on the making and maintenance of good roads.

During the administration of Mr. Enos, the first real efforts to do away with expediency and to probe for the solid rock of constitutional truth and justice were made. During 1913 the aggregate amount spent on road-making has been estimated at $478,050,000 in the United States.

John A. Wilson succeeded Mr. Enos in 1914 and was re-elected in 1915. He is a motorist of the highest type and under his administration the development of the constructive, corrective measures that really commenced to grow in 1913, waxed stronger and broader. The removal of several of the activities of the association from New York to Washington was a significant development tending to increase and magnify the efficiency of the whole organization.

The recent history of the four great boards of the organization has chronicled routine matters almost exclusively, but the routine is being directed like the tactics of four co-operating army corps. The main plans of campaign, some of which were made as far back as 1911, are being followed through by the commanders of each of the armies.

The Legislative Board has made distinct progress in tearing down the false fabric of unjust laws enacted when the industry was young and lacking in power and numbers. It fought and checked the trend of discriminatory laws and started to build upon the solid foundation of truth.

In the Contest Board there has been a radical change, or rather series of changes since the death of Mr. Butler. As has been outlined in this sketch, the fundamental conditions surrounding contests

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changed as the general run of automobiles reached a stage approaching mechanical perfection. Mr. Butler was succeeded in 1911 by William Schimpf, of Brooklyn, a broad-minded, conscientious official who donated his time and services to the work.

A. G. Batchelder, chairman of the Executive Committee, is the commander in the field of all the armies of Three A's. He presides at the councils and for years has had more influence with the various administrations than anyone else. He edits and manages *The American Motorist* and, ex-officio, has a hand in nearly every activity of the organization. Mr. Batchelder was a newspaperman of prominence before entering the automobile field, and during the past ten years has developed qualities of much importance to motordom. As an executive he is conservative; as a diplomat, effective, and as a motorist, radical.

The American Automobile Association has performed a great service for the motor car and it has an equally great mission to perform in the years to come.

At the annual meeting of the American Automobile Association held at Boston, May 17, 18, 1915, the following officers were elected:

John A. Wilson, Pennsylvania, president.
Dr. H. M. Rowe, Maryland, first vice-president.
Ralph W. Smith, Colorado, second vice-president.
Percy J. Walker, California, third vice-president.
H. J. Clark, Minnesota, fourth vice-president.
Preston Belvin, Virginia, fifth vice-president.
John N. Brooks, Connecticut, secretary.
Horace A. Bonnell, New Jersey, treasurer.
The chairman of the four boards were chosen as follows:
Contests—Richard Kennerdell, Pennsylvania.
Good Roads—George C. Diehl, New York.
Legislative—Richard H. Lee, Ohio.
Touring—David C. Joyce, Illinois.

FRANK GARDINIER WEBB

Frank G. Webb, of Brooklyn, took rank among the leading motorists of this country when he accepted the chairmanship of the committee on organization and constitution, March 4, 1902, at the preliminary meeting called to found the American Automobile Association

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at Chicago, and since that time always has maintained that rank.

Those are not lacking who consider Mr. Webb the father of the American Automobile Association. Certainly he was one of its most active officers, and is so today. His service to organized motordom stands as an example of unselfish devotion to a great cause, the success of which did not mean a single penny to Mr. Webb.

He became interested in the motor car from watching the first 50-mile automobile race staged on Long Island under the auspices of the Automobile Club of America in 1900 and soon afterward purchased his first car, a single-cylinder Winton, which was of the type known as "The Camel" on account of its hump and gait. This car, it may be noted had a fly-wheel that weighed 350 pounds.

October 16, 1900, he, with A. R. Pardington, Louis R. Adams, Robert Darling and Charles W. Spurr, incorporated the Long Island Automobile Club, an institution that has been one of the most important factors in developing the use of the automobile in its jurisdiction since that time.

Mr. Webb joined the Automobile Club of America in 1901 and remained a member until 1911. But his main interests were the Long Island Automobile Club, which he served as treasurer for two years; president for two years and as a member of the board of governors since its formation, and three A's.

In December, 1901, at a dinner of the Long Island Automobile Club, given at the Union League Club, Brooklyn, Mr. Webb addressed the 125 members present on the subject of a national organization and as the time was ripe and the need of such an organization apparent to everybody present, his words were received with close attention and at the close of his remarks an ovation was tendered the speaker.

In the ensuing two months, Mr. Webb took up the subject with influential members of the Automobile Club of America as well as those of the Long Island Club and when the formal call was issued for the meeting at Chicago in March, 1902, he was the logical man to head the committee on organization.

Press reports of that day show that his ideas were so clearly formed and definite that they were accepted by his colleagues and today form the basis of A. A. A. That is the foundation of the belief of many motorists that Mr. Webb should be considered the father of organized motordom.

Incidentally he served 20 months as president of the New York

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State Automobile Association and was a member of the first Vanderbilt Cup Commission, before and during the running of that classic race on Long Island in 1905 and in fact until the race was transferred to Savannah.

In the American Automobile Association, Mr. Webb always has been a director; always a member of one or another of the great boards of the association, where hard work without much spectacular recognition was the rule; nearly always a member of the executive committee and never received a cent for his services.

Nay more: In the 14 years he has been identified with the organization, he has given time, energy and service that cannot be valued too highly, the results of which are to be found in whatever of constructive good has been brought about by the national organization.

Mr. Webb is a simon-pure American. His father's people descended from Christopher Webb, an Englishman who emigrated to Massachusetts in 1626, and he traces his ancestry back to Governor William Bradford of Massachusetts, thus making his right to membership in the Mayflower Society a solidly accomplished condition.

His mother before her marriage was the gracious and graceful Nellie Gardinier, whose forebears emigrated from Holland in 1645, settling in New Amsterdam colony and remaining generation after generation as prominent citizens of the colony under the British rule and under the Stars and Stripes. Her family was of French-Huguenot blood and the family name was taken from the occupation of her ancestors, who were hereditary gardeners for the Dukes of Orange.

Mr. Webb keeps abreast of all the developments in organized automobile work and is chairman of the street traffic committee of New York; member of the Safety First Society and is actively engaged in several other bodies, the object of all of which is to improve motoring conditions.

As simple proof of the broad claim that has been made that veteran motorists, and particularly motorists of the class of Mr. Webb, are scrupulously careful of the rights of others, it may be noted that in the 15 years Mr. Webb has been an enthusiastic automobile owner, he has never caused an accident, no matter how slight, and has never been arrested for speeding or anything else. A glance at the records makes this statement seem quite important when compared with recklessness of some of the more recent acquisitions to motordom.

He is astonishingly young-looking to have borne such a prominent

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part in the development of motoring. Mr. Webb is a bachelor but his friends say that he wedded the automobile in the early days and remains true.

SOCIETY OF AUTOMOBILE ENGINEERS

In the year 1911, when the automobile factories were turning out several hundred millions of dollars' worth of cars, it was found that one company, making lock washers for the automobile trade, was obliged to supply 800 different sizes to be used with bolts having a diameter of from 3-16 to ½ inch. Eight hundred kinds of lock washers on bolts varying in diameter only 5-16 of an inch!

At the same stage of automobile progress it was discovered that 1600 different sizes of steel tubing were being specified by automobile makers!

Mighty few car owners know what a lock washer is, and only a few care whether steel tubing is used at all in their cars or not, but to the manufacturing industry the above facts were interesting. If the engineering and draughting departments of an automobile company create plans that call for sixty or seventy sizes of lock washers, most of which have to be made to order to fit bolts that only vary ¼ inch in diameter and if the company orders eighty sizes of steel tubing, as one used to do, the manufacturing cost of the car turned out must be materially higher than it would be if only six or seven sizes of lock washers and a half dozen sizes of steel tubing were used.

Now these two elements compose a comparatively small part of the automobile and represent a very minute part of the work of the standards committee of the Society of Automobile Engineers. Nearly everything else that goes into the car is of more relative importance than the two items mentioned and the examples are taken because of their illustrative character rather than their importance.

The Society of Automobile Engineers has reduced to standard almost everything that goes into the modern automobile that might just as well have been standardized at the beginning of the manufacturing industry. For instance, it has established certain sizes of magneto-bases so that if for ony reason the stock instrument supplied with the car is unsatisfactory, the base will not have to be changed if the owner wants a different make of magneto installed.

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In accomplishing the great constructive work that has been done, the society has been obliged to steer clear of the other extreme—namely, a stiff unyielding system of standards, that would serve to take away a certain measure of originality and individuality from the engineers and designers and as a consequence from the cars they turn out.

Aside from all considerations of economy in time and in increased quality of product, the automobile industry graciously admits that the work of the standards committee of the society has been the means of saving many dollars on each car that has been turned out since the promulgation of the standards. It is impossible to average the saving of time with reference to each car, and the additional quality that is included in modern manufacture due to standardization is likewise a difficult item to reduce to a money-saving basis, but it is quite certain that either of these considerations exceeds the actual money-saving accomplished by standardization.

In 1910, under the leadership of Howard E. Coffin, vice-president of the Hudson Motor Car Company, the society really bounded forward and assumed the position of world leader in the field of automobile engineering.

When the various sub-committees made their first survey of the field, a chaotic condition was found. The engineering departments of all the companies were working independently. In the draughting rooms, specifications were prepared calling for the use of materials and elements of manufacture that had to conform only to the ideas of the engineer engaged in the particular work. If he and the draughtsmen marked the plans to use certain sizes of lock-washers, steel-tubing, magneto-bases, or any of the other thousands of items that go to make up the automobile, and if the specifications happened to call for sizes a few ten-thousandths of an inch larger or smaller than the regular stock sizes made by the manufacturers of such parts and materials, they had to be specially made to fill the order. Now, if minute differences, represented by a few ten-thousands of an inch more or less, were really important, there might be reason for having the parts made to order, but if they added little or nothing to the car, except in its cost to manufacture, they represented a waste of money, time and effort.

These three things are the most important of all to be considered in modern, competitive motor car manufacture. It was the careful observation of all three that has made the American automobile indus-

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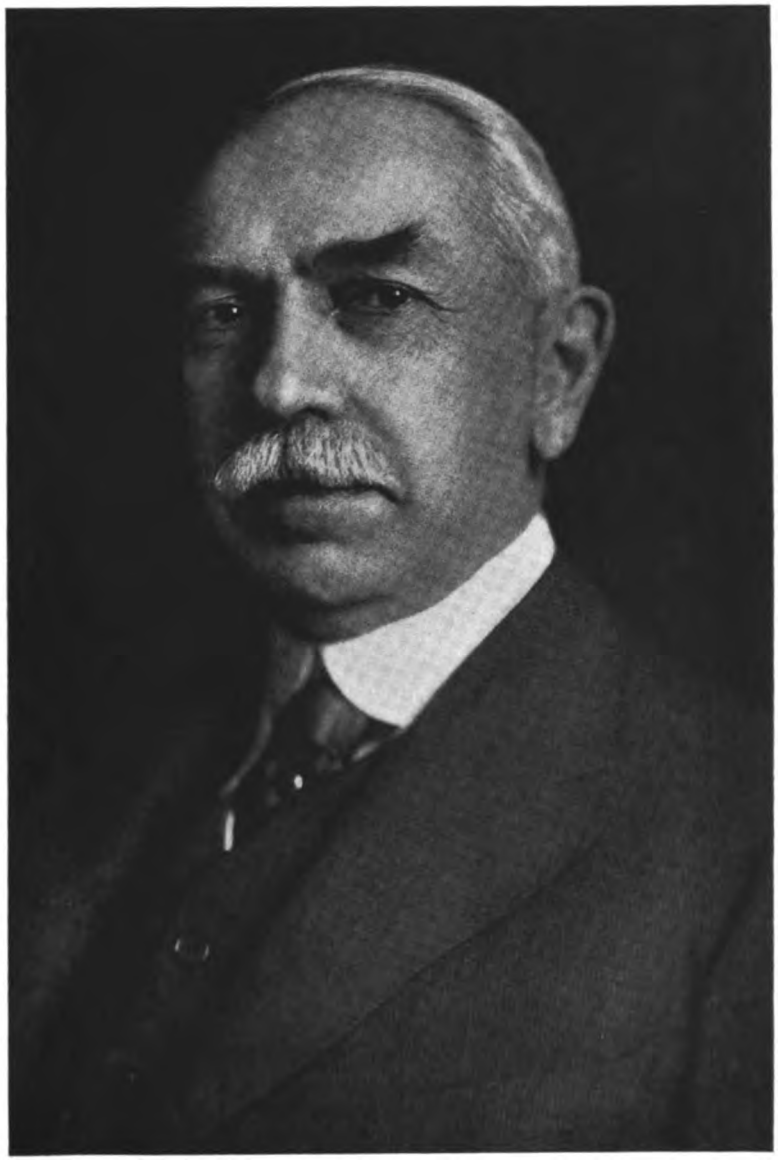

HORACE MONROE SWETLAND

Founder of the Society of Automobile Engineers. Head of the Class Journal Company.

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COKER F. CLARKSON
General Manager Society of Automobile Engineers.

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try and the society was the medium through which these economies were framed and directed.

Standardization is the keynote of the society's work. It extends from top to bottom and clear through sidewise in the manufacturing industry. It includes among its more prominent phases a standard for metals, that has proved to be a battleground of supreme importance to the welfare of the automobile industry. Wheel sizes, tire fastenings, cotter-pin sizes, spark-plugs sizes, the angles of valve seatings and a hundred other elements of automobile making that could just as well be uniform without sacrificing an atom of originality in the design of the car itself, have been considered by the committee and have been made the subject of recommendations.

The main difference between the American automobile industry and that of the rest of the world is that the American factories turn out standardized products, so far as small details of manufacture are concerned, while the foreign factories do not follow that idea.

Standardization lies at the base of successful production in quantity and as a direct consequence is a fundamental part of American supremacy in the automobile field.

The Society of Automobile Engineers, the leading technical organization of the world concerned with the automobile, has other objects besides the establishment of a system of comprehensive standards. It is a research body; it is constantly working in the field of experiment, through the activities of the members which form the basis of tomes of reports covering their experiments; it fosters a spirit of co-operation and it provides means for the thoughtful consideration of the art and through its meetings, gives the opportunity for its members to come together.

It was born in January, 1905, in the brain of Horace M. Swetland and included less than a half-dozen members, among whom were A. L. Riker, who served as its first president; A. H. Whiting and E. T. Birdsall. It had no headquarters and no regular meetings were held. The members got together occasionally at dinner and discussed the problems of the industry more or less technically. Occasionally a few members were persuaded to join, but the growth of the society was small and slow at first. President Riker, an energetic and able man, worked steadily for the enlargement of the society, but at that time he was chairman of the technical committee of the A. L. A. M. and as the latter body outnumbered the new society and had a definite locale

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and habitat, it was small wonder that the importance of the committee appeared to overshadow that of the society.

In fact the development of the A. L. A. M. was so rapid and virile at that time, that it appeared to be a waste of effort to push the work of the S. A. E. along the lines originally indicated, because they appeared to parallel those of the A. L. A. M. committee.

In 1908 Thomas J. Fay was chosen president of the society. He was a scientist, deeply erudite in mechanics and metallurgy and a man of powerful personality. Under his administration the society increased in membership and the first national canvass was made to extend its list to all parts of the industry.

Henry Hess, president of the Hess-Bright Manufacturing Company of Philadelphia, succeeded Fay as head of the society, which by this time was growing rapidly in size and importance.

Under Howard E. Coffin's administration, which followed that of Hess, the society leaped into national prominence. The Mechanical Branch of the A. L. A. M. was swallowed up by the society and as that organization had absorbed the work of the original technical committee, the entire organized effort of the automobile engineers toward co-operation, exchange of ideas and the establishment of standards was free to focus in the activities of the S. A. E.

Swetland, Coffin and others who dreamed of a representative centralized engineering body for the automobile industry began to see the beginning of a materialization of their dreams. Chaos reigned in engineering practice so far as easily avoidable waste, due to lack of standards, was concerned.

The time had come to crystallize the efforts of the past into definite form to serve the great industry. There was no money in the treasury, no office of the society, except in the hat of the secretary. But these men of strong faith and belief in the purpose of the society dipped into their pockets to supply the funds and engaged Coker F. Clarkson, who had served as secretary of the Mechanical Branch of the A. L. A. M. to act as general manager of the society. Quarters were secured at Broadway and Forty-first Street, New York City, and from that day, the place of the society in the automobile world was established.

Through the recent administrations of Henry Souther, Henry F. Donaldson, Herbert W. Alden, Howard Marmon, Henry M. Leland and W. H. Van Dervoort the steady progress of the S. A. E. continued.

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The quarters of the society at Broadway and Forty-first Street were soon outgrown and the first move was to a suite in the United States Rubber Building at Broadway and 58th Street. From thence the S. A. E. has moved to the Engineering Building on West 39th Street, where it is located among a group of societies and organizations devoted to the development of applied mechanics.

Some idea of the growth of the membership of the society can be had, when it is understood that in 1905 there were four persons in attendance upon the first meeting and that it was difficult to get a quorum together at any of the meetings held during the following two years. In 1908 there were less than 250 actual members. In 1910, 310; in 1911, 899; in 1912, 1200, and in 1915 about 1800.

This membership includes not only active engineers engaged in automobile manufacture, but the technical men of parts and accessory companies and qualified persons who are engaged in co-ordinated departments of both classes of factories, and juniors engaged in any division of the automobile art. To these classes has been added an affiliate membership, the qualifications for which are sufficiently broad to take in numerous important and desirable elements that do not come within the rule for the other classes.

The first organized standardization committee of the society was formed in August, 1910, and consisted of the following eminent engineers and metallurgists:

Howard E. Coffin, president of the society (ex officio); Henry Souther, Hartford, Connecticut; James H. Foster, The Hydraulic Pressed Steel Co., Cleveland, Ohio; H. S. White, The Detroit Seamless Steel Tubes Co., Detroit, Michigan; Charles T. Jeffery, The Thomas B. Jeffery Company, Kenosha, Wisconsin; Elwood Haynes, The Haynes Automobile Company, Kokomo, Indiana; H. W. Alden, The Timken-Detroit Axle Company, Detroit, Michigan; Arthur Holmes, The H. H. Franklin Manufacturing Company, Syracuse, New York; W. H. Van Dervoort, The Moline Automobile Company, East Moline, Illinois; D. F. Graham, The New Departure Manufacturing Company, Bristol, Connecticut; G. E. Merryweather, The Motch & Merryweather Machinery Company, Cleveland, Ohio; A. C. Bergman, Simplex Automobile Company, New York; Coker F. Clarkson, secretary.

This small committee was the starting point, the seed from which economies in automobile making amounting, at the least calculation to

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millions in actual cash saved, have grown. How much their work and that of their successors has added to quality and saved in the elimination of delays, is beyond calculation, but it is certainly $10,000,000, perhaps five times that amount.

The standards committee attracts an attendance at its quarterly meetings that compares favorably in point of numbers with the entire membership of the society in 1910.

The chief accomplishment of the society, as viewed from the vantage point of 1915, lies in the fact that in practically every draughting room of the automobile industry, the accessory and parts makers, and the host of concerns that supply either or both the automobile or accessory trades with materials, or which are in any way interested in bidding for such business, will be found the data sheets of the Society of Automobile Engineers. They are placed where they can be referred to at any time and stand as a guide to the designers as to what sizes and materials can be had with most economy of money and time. They stand as an indication to the makers of such materials as to what types, sizes and qualities of their own product will be likely to be in greatest demand by the automobile and accessory industries.

This condition favors economical manufacturing because the manufacturer can center his efforts, energy and capital on the production of a few stock sizes that will meet the bulk of the demands outlined in the automobile specifications.

An excellent illustration of how a system of standards works to procure economy will be apparent from the following:

If one factory turning out 500,000 cars annually should place an order with a material manufacturer for a certain kind of steel, or lock washer, or rubber tire, or brass or anything else that goes into its product, it would be much more economical for a competitive concern to order the same identical part than it would to vary the measurement or specify some trifling change in composition, because the practice of the first concern is sufficiently large in itself to establish a standard practice in the elements that go to make up certain details of the car. Standard practice predicates machine tools, jigs, dies and templates to carry it out and a minor change or two in specifications wrecks the whole idea.

In considering this phase of the subject it must be understood that the changes from established and standard practice are not such as would produce an article markedly superior, or markedly different,

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for that comes within the field of engineering and design and the society would not undertake to standardize either of those factors.

In 1911, Henry Souther explained the exact nature of standardization work in the society as follows:

"Many have an idea that the form, the design and the shape of large portions of the machine are made alike. Nothing could be farther from the truth. Such a procedure would throttle originality and hamper engineering work. There is not the slightest danger that this would ever be accomplished, even if it were attempted.

"What is aimed at is standardization of detail; such as screws, lock washers, spring parts, bearing parts, water connections and many other small pieces too numerous to mention. It has been found that the numbers of these parts continue to multiply because each draftsman exercises his ingenuity and his fancy, getting something out peculiar to his own notion.

"There can be no possible gain in originality in such details as these, and it is this useless multiplication of parts that must be minimized."

And Howard E. Coffin went into more detail in telling of what was needed in this particular:

"Any standardization at this time should not be an attempt to standardize the practice of the engineers, or the exercise of engineering ability, but should be an effort to standardize the practice of the $15 a week draughtsman, and the way to do that is to place upon the walls of the draughtsman's room such reference tables as will guide him in working out the various problems that confront him. You cannot take the average draughtsman such as many of you employ and expect to supervise every movement of his pencil and dictate every dimension to be plaeed upon a drawing. It seems to me that the things which you should standardize are the things which might just as well be standard as any other way. Those are the things which are giving our purchasing departments trouble. Those are the things that cost us money. Those are the things we could just as well have correct when they leave our draughting rooms.

"The installation of that kind of standardization would obviate the possibility of such occurrences as we have all experienced when the parts-maker comes to us and explains a high bid by saying, 'If you had not insisted on specifying something that varies slightly from standard, I could have cut the price in two.' I think those are the things we

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should certainly attack first. All the rest of it will come in due time and come rapidly."

In 1915, Karl W. Zimmerschied, chairman of the standards committee, made the following statement, showing the tremendous importance of the progress that had been achieved under the development of standardization:

"There is no doubt that the most potent single factor in the brilliant rise of the mechanical industry of America is the almost universal adoption of the principles of interchangeable manufacture. There are underlying economic reasons for the opportunities which have continually arisen before us, but no nation with so few skilled mechanics as ours could ever have taken advantage of those opportunities so adequately without possessing the genius to conceive the idea of assembling things from parts wholly produced by automatic machinery. Nor could even such genius have brought success had the final conception failed to include the masterly yet simple provision that all such automatically produced parts should be so alike as to be perfectly interchangeable from one assembly to another.

"Given this system in its present stage of development, problems of vast quantity, production at remarkably low costs, of easy and rapid assembling, and of inexpensive maintenance become fascinating play. The seeming miracles of such intricate though wide-spread products as the sewing machine, the harvester, the talking machine, the dollar watch, and the automobile, become but the obvious fruits of a natural evolution."

The society followed the general lines indicated in the quotations above and the complex and detailed S. A. E. handbook came from its labors, a work that the industry could not do without.

And while standardization has proved to be of great value, it is by no means the only valuable work that the society has done. In order to realize this fact one should glance at the early automobile industry as compared with the practice in Europe. The first cars built in America, and in fact all American cars prior to the foundation of the society, lacked the quality of the best examples of the European art. The main point in which the foreigners excelled was in the quality of steel used in manufacture. Heat-treatment was used to some extent to provide steels for certain purposes, but the European cars showed a sturdiness and strength that the early American cars lacked in many instances. The European engineers were not particularly anxious to

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explain wherein lay the difference between their product and ours and we had to find it out for ourselves. Vanadium, tungsten, chromium, and other alloys and scientific heat treatment of special steels, was the answer. In 1905, Thomas Prosser & Co. imported a shipment of fifty tons of Krupp steel for use in the Simplex Automobile Company and from that time on the use of specially alloyed steels has grown in the automobile industry into an enormous total and enters into the manufacture of every car made in America to a greater or less extent.

Almost immediately after the introduction of special steels, the American cars began to stand up to the best European standards and in current practice the fine American car compares with the best of the world in every way except price, and in price it has no difficulty in making a joke of competition.

HORACE M. SWETLAND

The automobile industry is indebted to a publisher for the existence of the most potent engineering organization identified with the study and solution of the problems in motor car manufacture—the Society of Automobile Engineers. Horace Monroe Swetland, the man who has occupied first place in the field of automobile literature ever since the business of building and marketing automobiles could be vaguely designated by the term, a "national industry," founded that society.

The idea of the S. A. E. was the outgrowth of an experience that Mr. Swetland had in solving some of the difficulties that beset the engineers and manufacturers who specialized in designing, manufacturing and installing machinery for heating and ventilating.

Long before the day of the automobile he was identified with the publication called *Heating and Ventilation* and at a certain stage of the development of that branch of industry, he suggested that the representative engineers connected with it should form a society for the general benefit of their art. This was accomplished under the name of "The American Society of Heating and Ventilating Engineers" and proved its economic worth from the time of its organization.

Mr. Swetland caused one of his employes to serve as secretary and general manager of the new society and gave it his support morally, financially and editorially.

When he decided to take up the automobile industry and purchased

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the *Motor Review* from Emil Grossman and the *Automobile* (a monthly at that time) from E. L. Powers, consolidating them under the title of *The Automobile,* which has been published as a weekly since 1902, he began to figure on the formation of a society for the automobile engineers, to be constructed along the same general lines as those he installed in the American Society of Heating and Ventilating Engineers.

He realized that the existing practices in automobile engineering were wasteful, because they lacked any standard. He saw that minor and unimportant differences in design might well add a large item to the actual cost of making a car, without adding anything of value to the car itself. He was conscious of the chaotic condition of the new industry.

In bringing about the S. A. E. he used very similar ideas to those already in being in the other society. It was his personal idea and personal influence that called forth the organization. Of course, the big minds in the industry gradually arrayed themselves on the side of the society, because the idea given form by Mr. Swetland was a constructive idea, but there was a time when the society had to be nursed along like a croupy baby and Mr. Swetland proved an able nurse.

Prior to the formation of the society it had been patent to those engaged in the making of automobiles that there was too much lost motion, not only in the cars produced at that stage, but also in the plans for making them and in the execution of the plans.

Theoretically, everybody believed in co-operation, standardization and the exchange of ideas and information tending to eliminate waste of various kinds. In practice, however, the usual rule had been to conceal rather than to reveal even the most unimportant details.

One brilliant engineer of the period that antedates the society, remarked after a meeting that had been announced as a kind of experience meeting of men engaged in designing automobiles: "I gave a talk on a carbureter that we tested and abandoned last year and all the others did about the same."

The idea apparently was to deceive the other fellow into pirating some worthless and discredited element, to the detriment of his line of manufacture. At any rate, there was no earnest, sincere effort to co-operate to improve basic manufacturing conditions.

Mr. Swetland talked about the desirability of forming an engineering society and the first actual step toward crystallizing it into perma-

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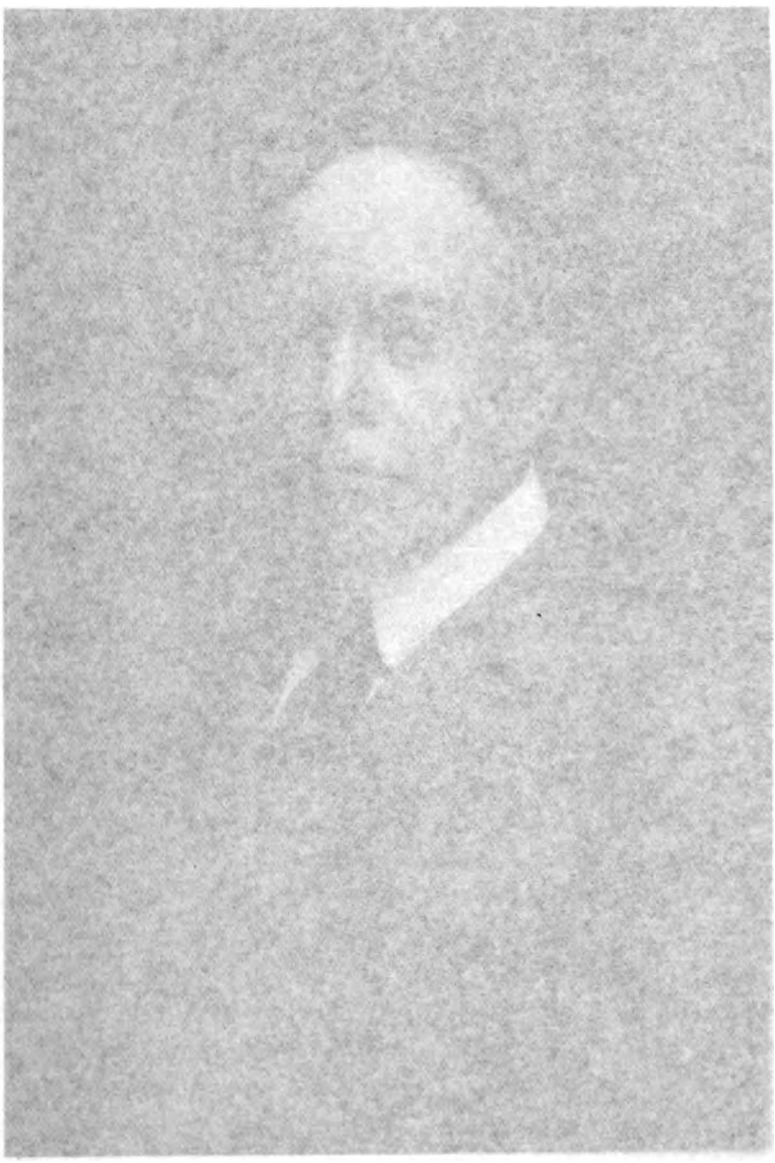

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THOMAS J. FAY
Second President of the Society of Automobile Engineers.

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E. T. BIRDSALL

One of the original members of the Society of Automobile Engineers and a constructive force throughout the whole life of the industry.

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nent shape was taken when he called a meeting, which was attended by A. H. Whiting, A. L. Riker, E. T. Birdsall and Mr. Swetland. At the first regular meeting, Mr. Riker was chosen president; Mr. Birdsall, secretary, and Mr. Whiting, treasurer. This was in 1905.

From that humble and unimportant beginning, Mr. Swetland has seen the society grow to full stature. He saw it swallow the Mechanical Branch of the A. L. A. M. He saw it develop to a stage where it was necessary to secure the services of such an expert on organization and administration as Coker F. Clarkson, to manage its affairs. In these latter days he has the satisfaction of knowing that entirely aside from what may have been added to the quality of the automobile product through the co-operative ideas exchanged among the engineers, that the standards adopted by the S. A. E. save an amount of actual cash in the manufacture of every car that has been estimated at many dollars.

Mr. Swetland, practically single-handed, held the society together in the early days. Sometimes the only general meetings held were at dinners promoted by Mr. Swetland. Several times he financed the organization so that it could go on.

The automobile industry is surely indebted to Horace M. Swetland.

The story of how he became personally interested in the automobile is typical of the man and the period. Back in the 90's his attention was called to the application of motor power to road vehicles, but like so many others of that day he believed that the steam engine held the solution of the problem and while abundantly able from a financial point of vew, he refrained from buying any of the gasoline or electric cars that bid for attention before the commencement of this century.

It was in 1900 that the fever for automobile ownership bowled him over and he put in his order for a Mobile steamer, the factory engaged in building which was located at Tarrytown, N.Y. He could not secure an immediate delivery, because the press of orders on the factory caused exasperating delay. One of the conditions imposed by the factory was that the buyer must undergo a course of instruction before taking possession of his car and in due course Mr. Swetland was notified to go to the factory for his lessons. These consisted in riding around the factory grounds for about ten minutes and at the conclusion he was pronounced competent and fit to drive, very much the same as the modern chauffeur in a state examination.

He was a "Blue Lodge" enthusiast by that time and lost not a moment in having the car shipped to his home in Fredonia. At last the

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railroad agent at Fredonia was notified that the freight car containing the automobile had arrived at Dunkirk and special permission had to be secured in order to unload the car from the railroad. This was obtained and Mr. Swetland, expert in steam engineering, but unfamiliar with steam automobiles, had to learn by actual experience how to get up steam in the new contraption. In the dark he finally succeeded and drove the car triumphantly to his home.

There was little sleep in the Swetland establishment that night, because he and his wife had planned to give the car a thorough try-out just after dawn the next day and they were all ready for the start at 5 a. m. The trip was short. Mr. Swetland had steam up and Mrs. Swetland stepped aboard. Amid the plaudits of the family and servants, the owner steered the Mobile down the driveway and turned into the road that passes in front of the estate. The car ran smoothly and easily and the passengers were just beginning to enjoy the sensation when Mr. Swetland realized that they were approaching a long, rather stiff hill. He opened his throttle and the car sped up the grade, almost to the summit, when there was a distressing sound that is entirely indescribable—a cloud of steam and the Mobile came to a stand.

It only required one look at the engine to convince Mr. Swetland that for the time being, at least, the car was out of commission, for the boiler was completely burned out and there was not a pound of steam in the engine.

Repairs were made after some delay and for a year or more, Mr. Swetland and his automobile furnished targets for the editorial flings and arrows of the local newspaper. He retained his enthusiasm through all the bombardment of the press and by his persistent use of the car, gave the new art a lot of practical advertising.

Mr. Swetland is still actively at the helm of his great publication plant and through the sturdy health that has been fostered by the use of the car, necessitating his spending a part of almost every day in the open air, he appears much younger than his admitted age. He was born at Mayville, Chautauqua County, New York. Today he is rated as a prominent citizen of Montclair and through his numerous and varied commercial and financial enterprises, one of the leading business men of New York.

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THE AUTOMOBILE CLUB OF AMERICA

About the time Alexander Winton and Elwood Haynes really commenced to sell American made automobiles there were quite a large number of imported cars owned by individuals and used in and about New York. There were some American electrics and steam cars also and the total number of all kinds of automobiles running in the United States was probably not far from 300 when spring opened in 1899.

The car was such a curiosity at first that the appearance of one of them on the street caused crowds to gather, but as the novelty began to wear off from the viewpoint of the public, hostility, which was carefully nurtured by the so-called "conservative" elements took form against the automobile and in place of good-natured curiosity, the crowds took to jeering.

On June 1, 1899, shortly after Winton completed his second run from Cleveland to New York in one of his cars, Whitney Lyon and the late George F. Chamberlin issued a call to motorists to meet at the Waldorf-Astoria, New York, for the purpose of forming a club of automobile owners. The call stated that it was almost certain that the automobile, as a form of sport, would find a place in American life and specially pleaded that the owners of cars and those who contemplated ownership, ought to combine to provide some sort of adequate storage place where expert mechanics could look after repairs. It was also stated that if the club idea appealed to the motorists, a club-house might be secured where literature bearing upon the subject should be on file and where the members could gather for social intercourse and discussion of the new art.

On June 7, 1899, the meeting was held and Mr. Chamberlin was chosen chairman and Captain Homer W. Hedge, secretary. There were some thirty persons present and Mr. Lyon in explaining the purposes of the meeting called attention to the fact that there was an intense spirit of hostility toward the automobile, which was particularly apparent among the owners and keepers of stables, upon whom the motorists had to depend for storage of their cars. This spirit of hostility was also apparent in the attitude of the authorities which had barred the cars from operation in public parks and threatened them with expulsion from the public roads.

Winslow E. Buzby, one of the incorporators of the club, in company with Whitney Lyon, offered himself as the means for forcing the

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issue of opening the park to the automobile. Mr. Buzby owned the first car sold in New York, having ordered an electric automobile from A. L. Riker in 1896. Riker thought he could build a good car for about $500 and the original contract made between the two called for that amount of money. About three months after the order was given, Riker informed Buzby that the car would cost more and the price was raised to $900. Later it was found that $900 would not begin to cover the cost and there was another raise to $1800; then to $3600 and finally, when the car was completed, Buzby had to pay $3800.

It was a good automobile, however, and would run forty-odd miles on a single charge. Buzby ran it all over Brooklyn and Manhattan during 1897 and 1898 and was the pioneer to get into Prospect Park, which feat he accomplished by giving a personal demonstration to the then chief of police. One of Duryea's cars was located in New York during part of this period, but Buzby declares it would not run with any degree of regularity. A. C. Bostwick's car and that of Whitney Lyon were of later dates than that of Buzby.

Shortly after the incorporation of the Automobile Club of America in the fall of 1899, a rule that had been promulgated, barring horseless vehicles from Central Park was deemed to be unjust and burdensome. Buzby volunteered to be the sacrifice and he with Whitney Lyon as passenger, drove to the 59th Street entrance only to be halted by the police.

"You can't go in there," remarked the policeman.

"Why not?" inquired Buzby.

"Because you can't," explained the officer.

"I bet I will," insisted Buzby.

"I'll bet you won't," rejoined the law.

And then Buzby pulled the lever a little and the car pushed against the policeman.

"Hey, you're pinched," protested the policeman; and so it proved.

At the trial Buzby was discharged and Central Park was opened permanently to the automobile.

There was much enthusiasm shown at the meeting and a committee was formed to prepare for organization. On August 16 a charter was granted by the State of New York and on October 16 the club was duly launched with the following officers:

President, George F. Chamberlin.

Treasurer, V. Everit Macy.

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Secretary, Homer W. Hedge.

Rooms were rented at the Waldorf and the club, under the title The Automobile Club of America was at once recognized by the clubs of Great Britain and France as the National Automobile Club of America.

The objects of the club were to protect and encourage the individual in the use of the automobile; the manufacturer in developing it; good roads and against hostile legislation.

The original directors of the club were: Frank C. Hollister, Winslow E. Buzby, Whitney Lyon, George F. Chamberlin, Homer W. Hedge, William Henry Hall, George Moore Smith, V. Everit Macy and Charles R. Flint.

The first victory won by the club was when it fought the foolish rules and ordinances enacted to bar the automobile from the public parks. The common sense involved in the club's position against these ordinances was so apparent that they were duly repealed after a series of public meetings and hearings before the law-makers.

November 4, 1899, the club promoted and staged the first parade of automobiles ever held in this country when 34 cars, including one bicycle and a delivery wagon moved up 5th Avenue to Harlem and thence to Riverside Drive where those who were able to drive their cars up the rather stiff grade, had luncheon at the Claremont. Some of the cars could not mount the grade, however.

Ten steamers and three gasoline vehicles took part in a run to Kingsland, above Tarrytown, January 27, 1900. Five steamers succumbed to the cold and only eight cars finished. The first road race was the Springfield-Babylon, 50-mile affair, April 14, 1900, more fully described in another chapter and the first long-distance run of the club was to Philadelphia, June 2, 1900, in which twenty cars started and sixteen finished. The elapsed time was just under 12 hours and the distance, as routed, 117 miles.

Albert R. Shattuck, one of the pioneer motorists of the country and a charter member of the organization, was elected president of the club in 1900 and pretentious plans were formulated to further the objects of the organization. The club, at that period had a membership of 260 and was growing rapidly in numbers and importance. President Shattuck was one of the first really effective influences to urge the improvement of highways because good roads were needed for automobile purposes. There was no nonsense in his endeavor to bring

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about good roads; no hypocrisy about seeking them for the farmer or anybody else. He wanted good roads because they were required for motor car operation. Mr. Shattuck knew that good roads would be good for everybody but he did not waste any crocodile tears in his argument.

He also was accountable for most of the keen, incisive suggestions to legislators about motor vehicle laws, taking the position that the automobile was simply personal property and a road carriage, against which confiscatory laws were totally out of place.

In fact, his attitude in 1900 was about the same as that of the most advanced thinkers of 1915 and if his words had been heeded, in a broad, general sense, it is quite likely that thousands of lives sacrificed to recklessness would have been saved and millions of dollars wasted in the enactment of futile, discriminatory statutes would have been conserved.

Among other things for which President Shattuck worked was the first appropriation of $50,000,000 made by the state of New York for road improvement, finally enacted in 1905. He served three years as president and when he laid down the office, the club had a membership of 454.

The first exhibition of automobiles in this country was engineered by the Automobile Club of America, November 3, 1900, at Madison Square Garden, with 66 exhibitors. Each year thereafter the club either promoted or was officially interested in shows, until 1909, when the manufacturing industry had attained such growth and importance that it took over the exhibitions.

The club staged several reliability contests at the period of automobile development referred to by Simeon Ford, when he characterized American cars as being a kind of "cross between an ice-cream freezer and a cuckoo-clock."

September 9, 1901, the first long-distance "endurance contest" started over a 500-mile course from New York City to Buffalo. There were eighty cars lined up at the start and forty-two of them reached Rochester, September 13, where it was learned that President McKinley, who had accepted the duty of reviewing the automobile column upon its arrival at Buffalo had fallen at the hand of an assassin. The tour was officially abandoned at Rochester, but quite a number of the contesting machines completed the run unofficially.

May 30, 1902, the club promoted a 100-mile non-stop run from

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New York to Southport, Conn., and return, which had fifty-five starters; forty-four finishers and twenty-eight perfect scores.

October 9-15, 1903, a reliability run to Boston and return was staged in which sixty-eight of the seventy-five starters completed the 488-mile route. In May, 1903, the club gave a commercial vehicle run of two days over 40 miles of city streets and suburban roads, which proved to be severe enough to eliminate four of the eleven starters.

The grand prize gold cup was donated to stimulate racing development in 1908.

Winthrop E. Scarritt succeeded Mr. Shattuck as president in 1903 and Dave Hennen Morris followed Mr. Scarritt in 1904 and served in 1905, when the club membership had grown to 1250.

The tremendous usefulness of the club had been demonstrated and its need of a permanent club-house was quite apparent and in May, 1905, it was decided to build an adequate structure to house the organization. Nearly $600,000 was appropriated to carry out the plans of the following building committee: Colgate Hoyt, chairman; Schuyler Skaats Wheeler and Albert R. Shattuck; and the cornerstone was laid with impressive ceremonies in March, 1906.

Colgate Hoyt succeeded Mr. Morris after the annual meeting of the club in 1906, served two years and was followed by Elbert H. Gary, whose term extended to April, 1910. Henry Sanderson guided the destinies of the club until June 6, 1912, when Frederick W. Whitridge was elected, serving for one year. Henry B. Anderson succeeded Mr. Whitridge, retiring May 4, 1915, when Alexander J. Hemphill was chosen to leadership.

From its inception the Automobile Club of America has been composed of the leaders of all lines of life and activity in the United States. Its early membership included the forefront of society, finance, business and professional life and it has so continued.

The club-house and garage, located on West 54th Street, New York City, is an elaborate building equipped in every department to serve the members.

The touring bureau is a useful element of its work, but the garage is by all odds the most important department of the club.

In the way of actual service the Automobile Club of America has done much for the automobile. First, it led the fight for the right to use the car. Second, it tested and tried the car through its runs, races and trials of various sorts; installed dynamometers and supervised official

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tests which were all directed toward the improvement of the automobile. Third, it provided a garage for its members that was a distinct step in advance of its time.

As a social organization, the Automobile Club of America did an immense amount of good in the early days, but in modern times its machinery, equipment and location are most useful in a semi-public sense, for it can be said with truth that the club is the center of quasi-public efforts to improve road conditions, which includes everything from basic law to the discussion of methods for quickening the passage of vehicular traffic at a specific point or the consideration of improving some detail of municipal activity.

Its present officers are:

President, Alexander J. Hemphill.

First Vice-President, Edward Shearson.

Second Vice-President, Henry R. Taylor.

Third Vice-President, Percy A. Rockefeller.

Treasurer, Dudley Olcott 2nd.

Secretary, Elmer Thompson.

Chaplain, Wilton Merle Smith, D.D.

Its honorary governors, headed by H. R. H., The Duke of Connaught, includes sixteen European gentlemen, noblemen or royalties, while the actual administration is in the hands of the regular officers and directors divided into three classes, one of which retires each April. These classes are as follows:

Class of 1916: Henry B. Anderson, Percy A. Rockefeller, Hamilton F. Kean, Horace E. Andrews, James C. Brady and James A. Stillman.

Class of 1917: James A. Blair Jr.; E. G. Gary, Oliver G. Jennings, William W. Miller, Dave H. Morris, William K. Vanderbilt Jr., and F. W. Whitridge.

Class of 1918: Henry Evans, Colgate Hoyt, Dudley Olcott 2nd, Henry Sanderson, Edward Shearson, Henry R. Taylor and Frederick D. Underwood.

In December, 1914, the club took possession of its new garage on East 72nd Street, thus giving it accommodations for 350 more automobiles. This building, considered the most completely modern garage in the country, was required and made necessary through the increased size of the club membership and its patronage of the club's facilities.

All told the club can care for 1000 automobiles at a time and

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ALBERT R. SHATTUCK

Pioneer motorist. Good Roads advocate. Ex-President Automobile Club of America.

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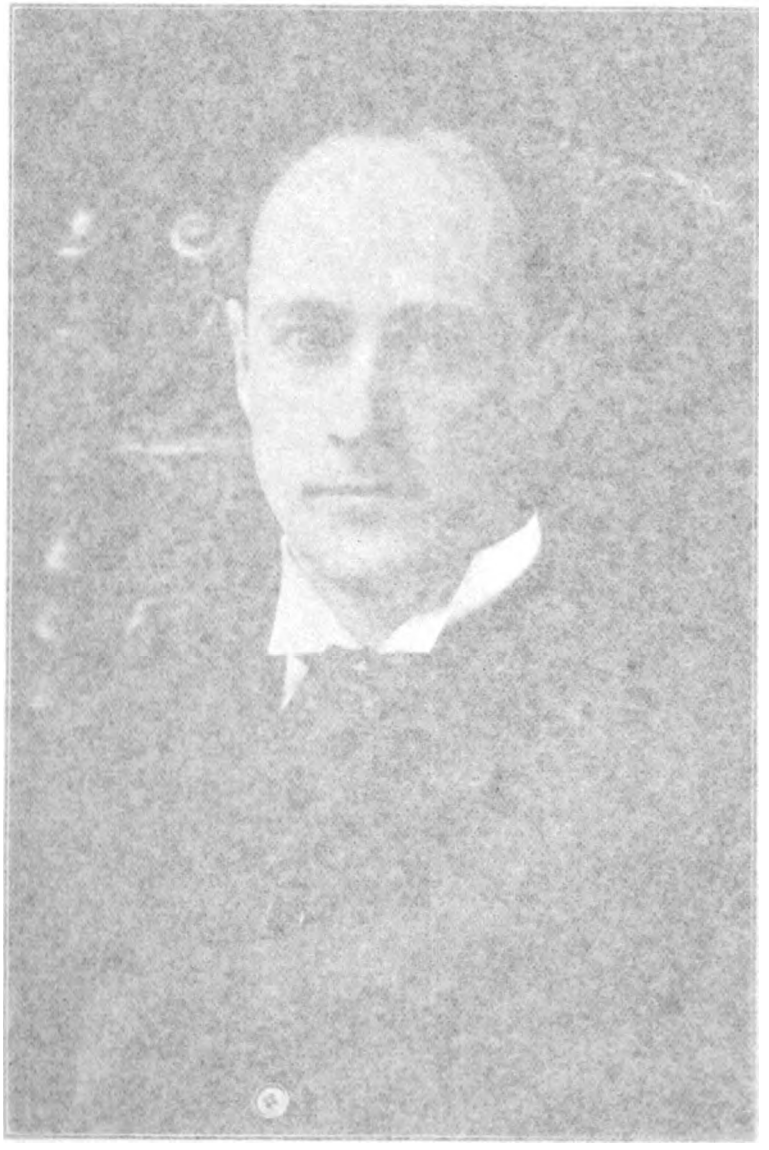

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DAVE HENNEN MORRIS
Former President Automobile Club of America. Diplomat and skilled politician.

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employs sixty or more mechanics. The total business of the supply departments in automobile accessories during the past fiscal year was over $700,000.

In 1914 the club accepted the membership of women and at the date of the last report forty-eight prominent ladies had joined.

Thus the organization, representing to an extraordinary degree the wealth, culture and leadership of this country, is still expanding in size and influence and bids fair to continue to do so for many years to come.

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CHAPTER VI

THE HISTORY OF THE LAW

LAWMAKERS ever have been unkind to innovations. They did their best to suppress the automobile almost from the first and never let up in their efforts to check and hinder the great industry until public opinion forced them to do so.

Students of constitutional law declare that the statutes enacted with regard to the automobile all over the world and the bills introduced in various legislatures ostensibly with the idea of having them crystalized into law, constitute the most curious collection of documents within legal lore. There was corruption in many of these measures, but there was vastly more ignorance. There was justice in some and there certainly was some good or bad reason for every one.

Getting right down to the basis of the whole problem of automobile law, the facts are that the automobile is first of all, personal property. Second, it is a form of carriage designed to be used on the roads. The only difference between the automobile and other forms of carriages is that it is swifter.

The laws view personal property in a definite way for purposes of taxation and in common sense and justice, which is, or should be, the essence of common sense, there is no reason for treating one class of personal property any differently than another. Consequently all laws that make a distinction between automobiles and other forms of personal property are open to query as to their constitutionality and suspicion as to their justice.

With regard to the second element of the proposition, it has always puzzled the unbiased mind to know why one vehicle should be tagged and licensed and surrounded by a mass of special legislation, while another should be free from such rules. Why one vehicle may cross state lines with impunity and another might earn its owner's arrest by following in the wheel tracks of the first.

The public frequently has marveled why a one-eyed epileptic could drive a pair of horses on the roads without question and an unlicensed chauffeur might get a sentence of 30 days in jail for using an auto-

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mobile. To be sure, the established custom provides a severe penalty against the responsible person who allows an epileptic to drive on the highways, in case his driving results in danger or damage, to person or property of others. Such person, whose negligence allowed, aided or permitted the epileptic to drive and therefore to bring about danger or suffering to others, is promptly reached by the heavy hand of the law. But the measure of the offense was that a certain degree of negligence resulted in a certain amount of danger or damage. It would be manifestly impossible for the statute law to define all the conditions of fact that should constitute culpable negligence.

As an example of specific statutes, the bill alleged to have been introduced in New York by a newly elected assemblyman, sheds a little light. The new-made lawmaker, according to the story, put in a bill to make it a felony for a street car conductor to assault a passenger. After the bill had been gravely sent to the committee on the good of the order, or some other equally appropriate, it was amended before final consideration. Its author was called before the committee and questioned as to the underlying facts. After hearing him, the committee tacked on the amendments, making the proposed law read about as follows:

"Be it enacted, that from and after the passage of this act, it shall be deemed a felony for a red-headed street car conductor to assault a passenger on his car on a Thursday morning."

Which explained the animus of the lawmaker who still bore slight traces of a black eye.

Nobody can say the lawmakers did not try to include nearly everything imaginable in various laws enacted and bills introduced concerning the automobile. They provided felony punishments for what the common law designated as misdemeanors and misdemeanor punishments for what should have been classed as minor offenses. The legislature of one state made a certain act a felony, while the legislature of an adjoining state called it a misdemeanor and the solons of a third, overlooked the matter entirely.

Even the courts sometimes made superb spectacles of themselves, as for instance, the learned judge who laid down the law to the effect that the automobile was suffered to run on the highways. That motorists had no inherent rights in the roads. That the car was to be regarded in the same way as a poisonous drug, intoxicating liquor, or concealed weapons. That there was right and reason in demanding a license to

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operate it, or rather that its operation should be made a matter of special privilege.

But probably the most amusing phase of automobile legal development would be the speed laws, if they were not so flagrantly unjust to the non-motoring public.

The situation in this regard is as follows: The laws of most states provide that speed of a certain rate shall be deemed presumptive evidence of negligent operation. The presumption arising out of such laws is that speed of lesser degree carries with it the assumption of care and due diligence. Therefore in case of accident where a lawful rate of speed is proven, conviction is difficult, despite the fact that every user of the road knows that sometimes a speed of 10 miles an hour ought to earn the driver a jail term without alternative of fine, and that sometimes 50 miles an hour is proper, safe and diligent driving. The real test is not the speed but the recklessness.

It has been estimated that the actual lawmaking expenses involved in placing the present laws concerning automobiles on the statute books of the United States, has amounted to something over $5,000,000. For all the constructive effect they have had, they might all be wiped off in a night and nobody would suffer. Their effect has been wholly bad.

One practical view of law is this: A statute is enacted by the people and therefore represents the will of the majority. If through misapprehension, corruption, or ignorance, on the part of lawmakers, even though the statute received the plaudits of a small but leather-lunged section of the public, a law was enacted that was consistently violated by nearly everybody who had occasion to come in contact with it, the natural conclusion must be that there was something the matter with the law, rather than with the large, important and sober-minded section of the public that violated it every day.

All speed laws are in this class, where they name a certain rate of travel as being illegal.

There is not the slightest reason why any of the special statutes now in force concerning the automobile should remain a moment longer on the books. There is excellent reason why they should be removed. There is now and always has been since the beginning of the automobile industry, a definite, enforceable law to cover every phase of automobile operation. There is a better revenue law in existence in every state than the automobile statute in the same state. And so the herculean

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efforts of the lawmakers and cranks represent an economic loss, in toto.

It is futile to take up any of the existing laws for consideration, for they are all worthless, or worse, but a few examples of the fearful damage that has resulted from automobile laws, may serve to show the obstacles that have been interposed to progress, nay even to the life of the industry.

The first and probably the worst example of statutory slaughter, so far as the automobile is concerned, was the discriminatory rule of 1831 in England.

This was not a statute in the true sense, but it had all the effect of statutory law. The situation was that the Turnpike Laws of Great Britain allowed a certain latitude in making charges for the use of certain roads. They are more or less conservative in England today, just as they were in 1831. When a custom is firmly established, it takes dynamite at least to jar it loose. Thus the rates for horse-drawn vehicles were fixed on a basis that was as firmly grounded as the organic law, but when it came to steam carriages, a new form of road transportation, there was no established custom as to rates. Therefore, the toll-gate keepers, anticipating the words of wisdom of a certain great American railroad magnate, made the traffic bear all that they thought it could pay.

Multiplying the horse-drawn vehicle rates by five, ten or in some cases twelve, laid a load on the steam-carriage industry in all departments save one. It raised whatever load there was in the treasury of the companies and transferred it bodily to the pockets of the toll-road keepers. Man cannot live by bread alone and the inventors, designers, manufacturers and operators of steam carriages were merely men after all. There might have been a lot of glory in continuing to make, improve and operate steam carriages for the benefit of the toll-roads, but there was no money in it for the industry.

In 1831 a select committee of Parliament made a careful investigation of the situation and reported to the lawmakers that the encouragement of the men who were devoting their lives, energies and wealth to improving and developing a valuable factor in the life of the nation, was an important thing to do and that a law should be passed, freeing steam carriages from the predatory tactics of the toll-gate and turnpike keepers.

The government listened to the report of the select committee and in a bill introduced into Parliament in 1833 caused a clause to be

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inserted specifically raising the load from the steam automobile business by ordering equitable treatment of the machines on the roads. The bill provided that the discrimination against the mechanically-propelled vehicles should cease, but it was defeated in the House of Commons.

The elements that were arrayed against the bill were the Tories, the horse interests and the ignorant sections of the populace who were swayed more or less by prejudice against anything they did not fully understand. In addition to these elements, there were many intelligent people who opposed the bill because of the real damage the lumbering steam wagons did to the highways; because of their fearsome appearance and the effect they had on the nerves of the people generally.

There always is some shadow of right in any public movement of the magnitude of that which led to the relegation of the British steam carriage industry to the scrap-heap in 1838 and it was to be found in this case in the damage to roads and the menace furnished by the carriages. When the select committees took testimony of some of the carriage-makers that they averaged from 9 to 12 miles an hour on the roads and that they sometimes reached speeds ranging from 17 to 30 miles per hour, the real solid reason that actuated the intelligent opposition becomes quite apparent.

Imagine a wagon weighing from 6000 to 10,000 pounds, shod with metal tires that cut through the surface of a dirt road like a harrow, or plow, and tore through the metalled roads as if designed to break them up, and the moving cause of the intelligent opposition can be understood.

It was later that runways or railways really made much progress.

On the other hand, the majority of those who fought the bill were not actuated by such reason. The Tories contested the measure because they did not want any innovations that might serve to disturb the existing order. The horse dealing and growing interests were moved by selfishness and a narrow view of the conditions; the horse owners and users were just naturally opposed to anything that might depreciate the value of their animals and that did serve to scare them on the roads.

The combined forces defeated the bill, but it was not until 1859 that the first of the remarkable collection of statutory discriminations was placed on the books, effectually putting a period to any sort of mechanically-propelled passenger vehicle development in England.

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The law of 1859 and the subsequent statutes passed from time to time until the early 70's, and kept in force until 1896, made it necessary to limit the speed of all mechanically-propelled vehicles on the common roads to 4 miles an hour and provided that a man with a red flag should precede and another follow such vehicles while moving on the road, and also set forth a lot of detailed rules to govern the conduct of the operators of such vehicles when there was any horse travel. Naturally there would never be any automobiles if a strict speed limit of 4 miles an hour was enforced, particularly against passenger vehicles.

As a noted English writer put it: "There was no more use of building passenger automobiles in England from 1883 to 1894 than there would be to build a battleship in the middle of Salisbury Plain today."

Thus, while all the rest of the world fairly seethed with interest in inventing, perfecting and building automobiles, Britain was a desert until the disgraceful laws were removed and repealed.

Sir David Salomons, Baronet, was the moving spirit who inaugurated an uprising against the motor vehicle laws and finally led to the enactment of a statute that permitted of British participation in the benefits of the automobile.

Sir David, who already had world-wide fame as a scientist and who had built an electric road wagon in 1874, promoted the first motor vehicle exhibition ever held in Great Britain at Tunbridge, October, 1895. The public interest in the exhibition was quite extensive and the matter was brought to the attention of Parliament in many ways and from many different angles. The newspapers were enlisted in the campaign and a detailed personal canvass of the members of the Commons and Lords was made. The Self-Propelled Traffic Association of Liverpool, which afterward became part of the Royal Automobile Club, was formed, and Salomons was chosen president.

The injustice and handicap under which Great Britain labored as a result of the existing highway laws was emphasized in public addresses and private interviews and eventually a bill representing some degree of fair treatment for the automobile was introduced and finally passed in 1896.

Great Britain had lost the advantage of 20 years of experimental work in developing the automobile, through the operation of the unjust laws and today the effects are plain to be seen in the British automobile industry.

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CHARLES THADDEUS TERRY
Leading lawyer of the Automobile Industry.

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The British factories turn out some very fine automobiles that represent high class of engineering, material, design and manufacture, but the total output of the British factories does not equal the annual product of any one of several second-class automobile factory cities in the United States. England is one of the best customers the American automobile industry has, and was so for several years before the great European war broke out, disturbing regular trade, but stimulating the importation of automobiles.

In the United States the legal course pursued against the automobile has been consistently unjust, illegal and unconstitutional. But here, too, there is something to be said in justification of the attitude of the public as expressed by the laws.

There was a real fear of the automobile on the part of many excellent citizens in the early days that has persisted more or less to the present. The flippant, impudent actions of some of the early motorists and the recklessness of a small fraction of even present-day operators, prejudiced many good citizens against the car and everybody identified with it. The early cars were generally pretty expensive and very uncertain in action, which led naturally enough to envy on the one hand and contempt on the other. While many coveted the wealth and position of motorists, they laughed at and despised them when they had to get down on their backs in muddy roads to make adjustments and repairs under the cars.

It should be remembered also that there were 20,000,000 horses in the United States at the time the automobile industry was born.

Those were the legitimate reasons for the birth and growth of the hostility against the automobile in this country.

The others were largely the same as those found in England in 1833, namely, Toryism, selfishness and ignorance. There has been much talk of corruption, but as a real influence on the hostile laws it is not to be ranked with the other factors mentioned.

In the pioneers days corruption was inappreciable in volume and was to be found mostly in the actions of petty peace officers, constables, etc., who grafted more or less all the time. There were no "striker" bills introduced into the legislatures until the industry had grown, waxed fat and prosperous. To the credit of the automobile industry it must be said that blackmail on the part of legislators has netted the corrupt solons a minimum of returns.

But the laws that have been passed, and more particularly the

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ones that have been introduced but never finally enacted, show in some instances an animus against the automobile that can be predicated on nothing but the disappointed hopes of corrupt legislators.

Up to 1900 there were no special laws covering automobile operation in the United States worth the mention. Occasionally some locality enacted rules to govern the use of the car, but it was not until after 1903 that the lawmakers really became active.

May 3, 1904, the first motor vehicle law was approved in New York state, but Kansas, Kentucky and one or two of the other states passed highway laws that specified and set forth rules for the government of automobiles, earlier than New York. About a dozen of the states failed to pass general laws on the subject up to 1910, but they were mostly sparsely settled and located in the south, or the desert sections of the west. In 1915 they all had some sort of motor vehicle law.

As a fair sample of all the laws, the New York statute of 1904 may be cited with regard to the penalties provided in it. The speed regulations provided that a maximum rate of 10 miles an hour must not be exceeded in closely built up sections; 15 miles an hour in villages, or cities, outside the closely built up section, and 20 miles an hour as the maximum speed allowed elsewhere. For the first violation a fine was provided; for the second a heavier fine, and for the third a still greater assessment, a jail penalty, or both.

Of course, the law was a joke. Nobody regarded it or pretended to. If the motorists of that day received their legal dues they all spent some of their time in jail. Naturally, they did nothing of the kind and almost without exception they violated the laws of the sovereign state of New York every time they took out their cars. They were all conscious of breaking the law, and the continued repetition of their offending against it stimulated the growth of a great disrespect for all law in the minds of many of them.

After New Jersey enacted a statute making it illegal for a motorist from another state to run his car in New Jersey without special license, one condition of which was the surrender of his legal rights by the appointment of the Secretary of State to act as his attorney in case circumstances should arise that in the opinion of the New Jersey authorities warranted proceedings to be brought against the visitor.

As soon as the special license feature was understood in adjoining

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states, it became quite a sporting amusement for New York, Pennsylvania, Maryland and Delaware motorists to see how grievously they could break the New Jersey laws without getting caught. If they could get into the state by stealth and without being observed, they violated all the laws they knew about, so far as operating an automobile was concerned, and upon escaping openly boasted of their prowess.

It is a part of the record of the New Jersey Legislature that in one year (1911), where the Secretary of State had been designated as the attorney of visiting motorists to whom special licenses had been issued and because of whose alleged violations of the law it was deemed necessary to bring legal proceedings, that 600 notifications from the New Jersey courts were returned from the addresses given by the specially licensed visitors, with the notations of the postal authorities that the persons named could not be found, were not known, or that the address given was a vacant lot, or something equally illuminating.

It is a pretty little study in psychology that 600 visiting motorists should have prepared *in advance* to make a laughing stock of a sober New Jersey statute. It seems curious that 600 citizens of other states having brains enough and money enough to make automobile ownership possible, which carries with it the assumption that they probably were respected and leading citizens of their own states, should deliberately prepare for the avoidance of consequences of breaking the New Jersey law by giving false names and addresses to the licensing authorities.

The really serious side of the matter does not show in those returned notices. If 600 managed to draw a "herring across the scent," by giving false information, it is to be presumed that the whole 600 probably did something to deserve being summoned. But how about the vast army that also took special licenses and who were not summoned? Did they too provide nullification of the New Jersey law, by giving equally untrustworthy information to the authorities? Assuredly they did.

Woodrow Wilson, Governor of New Jersey, had these facts laid before him in 1912, and was visibly shocked when they were presented. It was on his initiative that the Legislature was directed to correct the law which made a joke of New Jersey and liars out of otherwise impeccable citizens, without serving any useful purpose.

The early laws, that is, those enacted between 1908 and 1910,

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undertook to define a lot of conditions as applied to the automobile and its operation, that were better covered in the established customs governing the use of the highways.

As a sort of analogy the case of the newly elected lawmaker who wished to make the assaulting of a passenger by a red-headed conductor of a street car on Thursday a felony, may be cited again.

The situation is this: If the conductor admitted the facts of the assault and the day and the place, but proved that his hair was auburn, black, brown or even that he was bald, he could escape, while under the common law penalizing assault as a crime the color of his hair was one of those details that nobody should worry about except the offender.

Thus the automobile statutes that specified a lot of conditions, like the New Jersey law referred to, invited infraction, and they were surely broken consistently and practically unanimously.

Almost as soon as the first crop of automobile laws came into existence the manufacturers and users of motor vehicles began to get together to ameliorate conditions raised by the laws and their violation. As a general thing, the industry labored under a handicap by reason of the men who first took up the cudgels of motordom. They represented the ultra-radical type, as compared with the ultra-conservative mental angle of those who were interested in the enactment and enforcement of the motor vehicle laws. They bellowed and threatened, displayed their ignorance of law and justice in the halls of Congress and of the state legislatures and did an immense amount of damage by their activity. Of course, they failed, and the rebound resulting from their injudicious actions saw a worse lot of statutes introduced.

This work will not detail the lamentable failures of their efforts to secure some modification of the attitude of lawmakers toward the automobile, except to say that the first efforts of the automobile industry and motor users to secure more equitable laws were in effect an irritant, and it remained for the industry to develop men and methods to bring about the changes that are now developing.

The petty persecution of motorists in 1898 led to the formation of the legal department of the Automobile Club of America, which had for its avowed purpose the idea of securing justice for motor users. The activity of the club department was directed largely toward protecting its members from the rapacity of predatory officials, and was wholly good.

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But it remained for motordom to develop such men as Sidney S. Gorham, Terry and their type, before there was any appreciable progress made in the way of securing sane laws. It remained for the Selden case to emphasize the cumbersome practice in Federal equity procedure, and thus good resulted from evil, for the general attitude of legislatures has changed toward the automobile. Recent statutes are framed to declare common law principles in general terms, leaving the specific facts for court and jury to determine. In equity practice the great, useless record compiled in the Selden case undoubtedly was one of the strong factors that produced the present simplified equity rules.

The shocking lesson imparted to the public when a drunken motorist escaped conviction of manslaughter, because he was able to prove that he was not exceeding the speed limit, made and provided by statute, and consequently was presumed to have been driving with due diligence and care, put a new aspect on the matter of legal speed limits. There were some blatant ignoramuses who thought the condition could be remedied by reducing the maximum speed limit or providing by statute for the removal of the presumptions of law. With such men the world to-day has little patience. Criminal negligence in the operation of a motor car is quite as serious as criminal negligence in a powder mill, or the cab of a locomotive, or anywhere else that it is likely to become a threat to the public.

The drunken driver of a horse-vehicle who recklessly disobeys traffic rules, or who is culpably negligent enough to cause an accident, is protected by no such presumptions as the automobile driver in the same circumstances. Any speed at all is enough to bring about his punishment.

As an indication of the soundness of the foundation now being built to protect the public, it may be said that the more recent state laws enacted to govern the automobile—and they still aim to do that—eliminate the miles-per-hour provisions and put the responsibility for care and diligence in driving upon the motorist.

If the laws went a step further and simply declared the automobile to be a road vehicle subject to the laws and established customs governing road vehicles; or if the truly ideal condition had been reached where it might be assumed from the use of the car that it was a road vehicle and consequently subject to road laws, leaving nothing what-

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ever to be said in the statute books, a distinct advancement would be marked.

Up to the present it has been deemed necessary to specify, define and penalize various things about the automobile and its operation, as if there might be some doubt in the minds of the world as to what the automobile is, and as if the lawmakers did not know that everything offered in such proposed statutes was more fully covered in laws already in being.

The part played by the American Automobile Association in preventing the enactment of discriminatory laws has been important since the inception of that organization. But so far the success of the association has been in the direction of modifying bad laws rather than in preventing their passage. When the association represented only a scattered handful of motorists, it had to use diplomatic tactics, and in those days many a promising automobile statute was made ridiculous by the tacking of amendments onto its tail that added nothing to its gravity.

In 1905, when the association had grown in size so that it began to be a factor to be reckoned with, the first attempts were made to introduce real automobile laws. These failed, because the state of the public mind was of such a character that anything constructive from the viewpoint of the motorist stood no chance of enactment.

The broader minds in several of the state governments realized that the curious statutes that had been passed and approved failed of their purpose, and in order to get at the real facts they called representatives of the great automobile organizations into conference. It was explained at one of these meetings, which took place in Albany November 11 to 13, 1905, that no law whatever was required, if the purpose of the authorities was to control automobile operation and protect the public.

This statement was greeted with incredulity by the lawmakers, and the spokesman, one of the leading lawyers affiliated with the automobile industry, was sharply criticised for attempting to bring about a condition where the roads and streets would be filled with speed-mad, uncontrolled motorists, killing and maiming pedestrians, with or without intent, and monopolizing the highways to the exclusion of all other forms of traffic.

And to this day there are many good citizens who hold similar beliefs.

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In 1910 the first law framed with the assistance of the automobile industry was passed in New York. Advice had been asked and received in several other states, and statutes had been put into force embodying the ideas suggested by the motorists, but no full law such as the New York statute, called the Callan Act, had been adopted.

The Callan Act was a poor thing as a law, but some of its provisions were marked with greater liberality toward the automobile than those that preceded it.

The law contained a speed limit in miles per hour and an elaborate provision for registration and the examination of chauffeurs, and was rather harshly treated by the courts in several instances.

Up to the time of the Callan Act the influence of the industry on the statutes had been small, and in that law it was exerted only so far as it would serve to modify the ideas of other factors and influences that sought to have the basic law of the Empire State follow the British statute of 1859, or those that favored a law that would make motoring disorderly conduct, in its easiest construction. It was a series of compromises when finally prepared, representing nothing but expediency. But it proved to be a landmark because it was more liberal than other laws, in granting certain rights to a certain class of users of the public highways, already granted and guaranteed to them by the constitution, to be sure, but nevertheless set forth in statutory form in the Callan Act.

In some ways this was the worst injustice ever perpetrated upon the public in the way of an automobile law, because it recognized a higher rate of speed than the laws of other states. For that reason it was praised by a good many motorists, but they soon learned that the trouble was so deeply seated that what appeared to be a mere statutory half-loaf failed to satisfy them, and resulted in such a lot of unpunishable accidents that the very attitude of the public prints, where it was uninfluenced by advertising patronage, was rendered hostile.

A series of serious results followed the enactment of the Callan law. As has been said repeatedly in this work, the automobile industry has had to battle with a lot of things that are not material and never were. Through the spirit of expediency, the Callan Act was passed, and as a direct result of the increased number of casualties, the press, or at least that part of it that had any weight with public opinion, took a wrong angle from which to view the whole situation.

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The present attitude of the great newspapers, so far as their editorial policy is concerned, reflects one of the results of the passage of the Callan Act. The editor of one of the most influential of the New York newspapers recently said: "The only way anything about the automobile can get into this publication as pure news matter is when one of the darned things runs over somebody."

When the press feels that way about the case, it is reasonably sure that there is something radically wrong; either the editorial departments require a lot of information about an important matter of transportation, or else the automobile is a vapid, useless extravagance, meriting the term formerly applied to it, "a toy of the rich."

At any rate, the only progress that has been made so far in the field of legislation has been purely negative. It has been possible to prevent unjust aggression in a number of cases, but nothing to date that resembles constructive legislation has put in an appearance.

Since 1910 there has been marked improvement. The laws no longer represent bigotry, ignorance and prejudice to the extent they once did. 1910 was a kind of turning point in the history of automobile law, where instead of becoming gradually worse, the laws began to take on a more reasonable aspect and construction. From the black ignorance of the old sumptuary legislation, the laws since 1912 have all had a kind of sound reason about them and the trend is now sufficiently strong to raise the hope that in the course of a few more years the real law will be enacted.

There is the soundest sort of reason for this change of heart that has been noticed recently in legislative circles.

There are, or will be with the end of the 1916 selling season, 3,500,000 automobiles in this country. Reckoning five persons for each automobile, that would mean that there are 17,500,000 personally interested Americans. On the supposition that probably 7,000,000 of them are voters, the reason for the alteration of the attitude of the lawmakers takes on quite an understandable angle.

Seven million voters are not to be persecuted strongly, unless it is the deliberate intention of the persecutors to force the motorists to combine. What used to be quite a popular thing to do—the introduction of some measure providing certain onerous conditions against motordom, has gone out of fashion.

There is the amplest reason for this change of heart, for the motor owners of the United States own 78 per cent. of the property, both

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real and personal, and pay 90 per cent. of the direct taxes. The income tax is paid wholly by motorists. Motorists occupy nearly all the positions of prominence in every useful field of endeavor. And all these things are not because they are motorists, but because as prominent citizens, as wealthy men, as important factors in the financial, social, business and professional life of the country, they cannot get along without the car.

But the automobile industry has much to answer for in the exasperating delays that have marked the progress of automobile laws from ignorance and slavery to freedom. Imagine, if one can, the energy, money and time spent by the industry to try to get the Congress of the United States to pass a statute law designed to give motorists in interstate commerce the right to go from place to place without let or hindrance, as is already very definitely and carefully set out in the Constitution of the United States!!

And yet that is just what the industry did. Instead of appealing a test case to the United States Supreme Court, formed and maintained to pass on Constitutional questions, and reaching a decision on the merits of the case which would settle forever the status of the motorist in the eyes of the national law, the industry spent parts of three years in seeking a law that would have been mere redundancy at best, if it had succeeded in getting it passed and signed.

The industry as well as the public one day will see that if the rights of the public are to be protected, and by the public is meant the motorists as well as those who simply want to be motorists, the statutes framed since 1903 will have to be rooted out and destroyed. They cannot be modified so as to serve any useful purpose.

Actually, the situation has become so obvious to some of the thoughtful leaders of the automobile industry that there is a growing suspicion in their minds that perhaps the bellowing, blatant battles that have been staged by the representatives of the industry in and out of the halls of the legislatures may have been what are termed "Barney" fights, designed solely for show in public and for the financial betterment of the "Barney" fighters.

As an illustration of the term, it may be said that when criminals on certain occasions wish to divert the attention of the police from their activities, they stage a mock battle in another street to hold the police while they loot the hencoop in quiet security.

Thus, signs are not wanting that a watchful eye will be kept on

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the treasury when the symptoms of the next big legal battle, requiring expensive advocates, begin to develop. And when that happens the ideal automobile law will be in sight.

In equity, where the patent suits are fought and decided, there is nothing much to be said about the development of procedure. The coming of the automobile produced an immense number of patent claims, and since that time an immense amount of patent litigation. The ancient steam car art anticipated almost everything radical in the way of automobile invention in modern times. Of course, there were many details that were patentable in 1900, and there are probably many undiscovered to-day that will be eligible for patenting when they shall be discovered. Consequently only a few details have been sustained by the highest tribunal that has jurisdiction of such matters.

The automobile industry played a part in one great change that has occurred in equity procedure, but it was not solely responsible for it and did not affect the result by direct action. Under equity procedure prior to 1912 testimony in patent cases was taken out of court. If counsel made objection to a question asked of the witness by his opponent, the fact was noted and the witness answered anyway. This had the effect of stretching out the record to enormous length and cluttering it up with a lot of inconsequential things that merely added to the labors of the judges upon presentation, and perhaps clouded the issues by discouraging judicial inspection from the fact of volume alone.

Sometimes it took from two to ten years to get a final ruling in a given case. In the Selden matter suit was filed in the fall of 1903 and final decision of the United States Circuit Court of Appeals was made early in 1911. And action in the Selden case was not belated and delayed as it has been in some other actions. The record of the case was voluminous and United States District Judge Charles M. Hough commented severely upon it in delivering his opinion in the lower court. The Selden case was much worse in the matter of its record than any other automobile action to date, but it does not compare with some other actions outside the automobile industry in point of exhaustive records. It was quite enough though to call forth some scathing remarks from Judge Hough.

At any rate, the Supreme Court handed down a new set of equity rules in 1912, providing for less delay in pleadings and for trials in open court. The difference in time that it now takes to present a

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case may be illustrated by comparing the Selden case, which required six years between the filing date and decision in the District Court by Judge Hough, from which appeal was taken; and the Lindsay Auto Parts case against the Winton Motor Car Company, in Cleveland, where less than two years intervened between the entering of the action and the opinion of the District Court, in the fall of 1915.

However, the part played by the automobile industry in the matter of the new equity rules was only incidental. It was only one factor, after all, in the final result.

The only new angle that has been added to the development of the law has been in the insurance field. The car and its operation, damage, loss or destruction, have raised some new elements in insurance law. Automobile insurance is of four principal varieties—fire, theft, accident and liability, to which is added a fifth called collision insurance. Every motorist carries all five kinds, or ought to, and as a result numerous suits in which the automobile figured have been fought out to a conclusion. But automobile insurance is not so very different in any of its forms from the old policies that have been written to cover steamships; the property of railroads and the protection of the owners of buildings where elevators are used, and the questions of law that have been raised under them may be compared with the litigation of the older period.

However, some interesting questions of agency and the measure of damages have been elucidated by the courts through automobile insurance suits. These matters are local and specific in their character and save for the reference have no part in this work.

As a general proposition, the rules and customs of the road as established by centuries of experience were reduced to an incomprehensible mass through the efforts of the lawmakers who strove to govern, regulate and control the automobile by special statutes. The situation as it stands at the beginning of 1916 is that under the law, if the motorists received strictly legal treatment, they would all be in jail more or less of the time. Such laws, naturally enough, are disregarded, not only by those at whom they are aimed, but also by the authorities.

The whole matter is in a state of transition and development, and in the course of time, following the regular course of development, the old laws and customs of the road, modified perhaps to take cognizance

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of the superior mobility of the automobile over other road vehicles, will come back to their former position as the basic law.

In fact, the trend is in that direction, and the newest statutes show the most influence of the old Common Law.

WILLIAM A. REDDING

As chief patent counsel of the National Automobile Chamber of Commerce and its predecessors, William A. Redding, of New York, ranked as dean of the patent bar of the country by many important factors in the automobile industry, took part on one side or the other of many of the automobile patent suits that have figured so far in the development of the industry.

He has been connected with the industry and familiar with every step of its growth since 1894. He represented the Pope Manufacturing Company in the old bicycle days and later in the automobile field. He was one of the factors in the entry of William C. Whitney and his associates into the automobile business. Mr. Redding, with George H. Day and others, formed the Association of Licensed Automobile Manufacturers and has been identified with every major action in the patent field, for or against the association and its successors, since 1903.

He and Frederick H. Betts drew up the agreements lying at the foundation of the licensed association in such a way that the members were held together not only by common interest, but so firmly that nothing but the destruction of the Selden patent or the voluntary action of the association could absolve them from duties assumed toward each other and toward the association.

These agreements, breathing the truth and jealousy observant of the law, have come to be regarded as the model foundation upon which to build commercial associations. When it is considered that the Northern Securities Company, Standard Oil and other great combinations were dissolved by court order; that Steel, Copper, Sugar and Wool have been under fire for years, the skill used in drawing the agreements for the formation of the A. L. A. M. attracts attention, because the association was primarily a body of competitors and the hand of the law never stretched out to grapple it.

Mr. Redding and his associates realized that the automobile indus-

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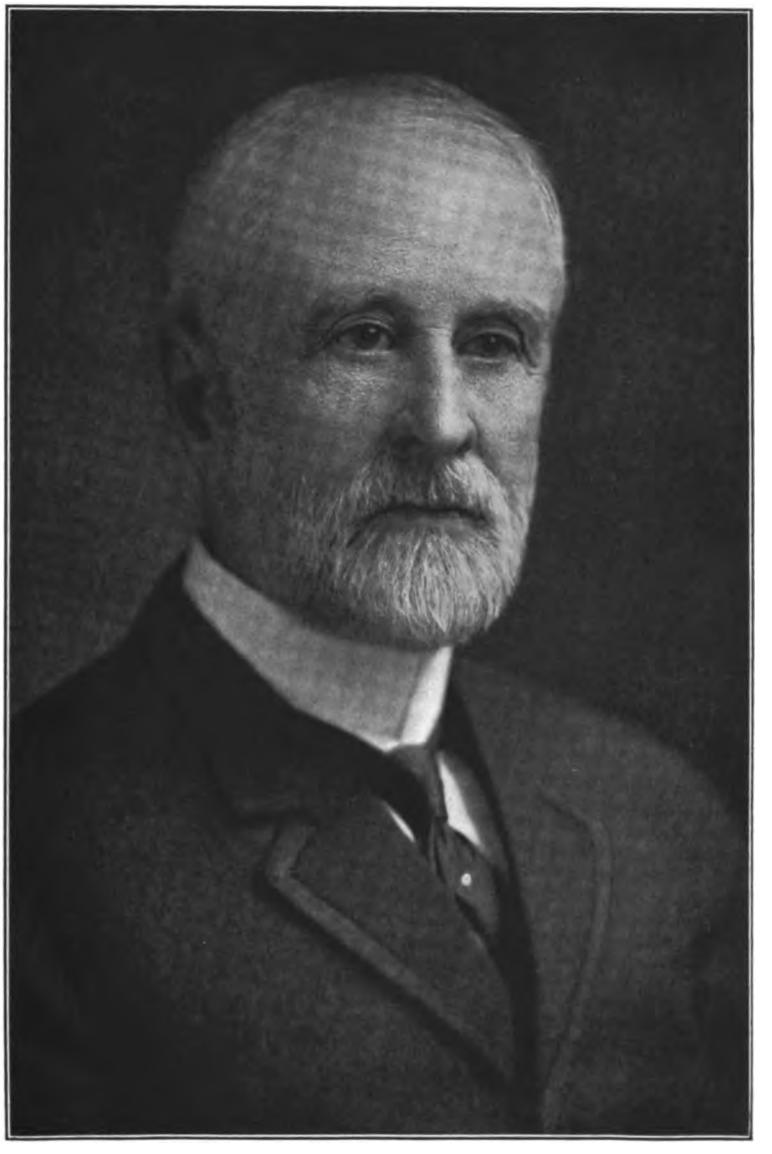

WILLIAM A. REDDING, LL.D.

Patent Counsel for the organized manufacturers. Won and lost Selden case and has had part in most important automobile litigation in equity.

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try would require much capital to finance it, and that the best way to get the capital was to bring about public confidence in the manufacturers. This could not develop if the public received the impression that all automobile companies were to be confused with the fly-by-night promoters, who sold large stock issues on the sole strength of a set of blue-prints and failed to manufacture even when the stock found a market.

It was a fundamental search that resulted in the A. L. A. M., which bore the responsibility for the stability of the industry for eight years during the period of establishing the automobile as a factor in transportation.

It was basic research work that was done in the Selden suits; it was far-sighted intelligence that led to the purchase and sale of the Canfield patent; it was diplomatic negotiations that led to the settlement of the Dyer suits and the acquisition of the Dyer patents, and Mr. Redding had a hand in them all.

The soundness of his reasoning in desiring to bring about stability in the making of automobiles has been demonstrated in the growth of the industry, and such growth resulted, in part at least, from the confidence bred in the public concerning the industry through the control exerted by the A. L. A. M.

He is an enthusiastic motorist and has had cars since the early days.

Outside the automobile industry, Mr. Redding long has been prominent. He is a native of Philadelphia and always has maintained a keen interest in the University of Pennsylvania, his alma mater. In 1918 he was elected president of the General Alumni Association of that university.

To Mr. Redding is due thanks for a considerable part of the intimate detailed facts set forth in this work and published for the first time herein.

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CHAPTER VII

GOOD ROADS

THE automobile was born into practically a roadless world and should be credited with nearly all the progress that has been made in building roads, because the road is part of the automobile, quite as much as Hiawatha's bowstring was part of his bow.

If the automobile were a dead economic loss in every other way except that it brought about whatever of good roads there are, it would still be the most valuable thing man has invented and developed since the railroad.

The whole history of transportation shows that the improvement in the means of travel always led and road development always followed. The oxcart came before the first road; the locomotive came before the railed right-of-way, and the automobile came ahead of the improved highway.

Prior to 1900 the roads of the world were a joke. The boasted French highways and the comparatively excellent roads of Europe were really poor excuses for roads as judged by the standards of what will be required to-morrow. They did have one quality that was absent in the United States, inasmuch as they were generally passable, while the American roads were not, except under favorable conditions. But the fact may as well be realized that the European roads, some of them built by the Caesars and Napoleons, were not good roads as measured by the new standards. They proved that they could not accommodate automobile traffic quite as completely as the roads of Northern France and Belgium have demonstrated their lack of capacity to stand up under the passage of heavy artillery.

These things show that the quality of roads is relative, like every other work of human hands. What might have been considered a very good highway for the use of light vehicles probably proved unable to carry heavy traffic and unusual stresses in all the centuries of civilization, just as the passable horse roads failed under mixed traffic during the first fifteen years of the Twentieth Century.

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In 1900 there were no good roads in the United States, outside the paved streets of cities. There were some bicycle paths extending pretty extensively into the country adjacent to large cities, but travel over them was arduous except in specially favored localities. The bicycle vogue undoubtedly paved the way for the automobile, but so far as actually furnishing the roads is concerned, the wheel may be likened to the appetizer one may take before dinner, rather than the dinner itself. The bicycle whetted the appetite for good roads, but the automobile supplied them, or, rather, has supplied the first course in what is scheduled to be the greatest repast in history.

Col. Albert A. Pope was one of the pioneers in the modern good roads movement. Col. Pope as head of a large bicycle factory learned that expansion of his manufacturing business depended upon increasing the number of good roads, and early in the bicycle vogue he inaugurated plans looking to the extension of usable bicycle roads. It was under the influence of Pope and other leading minds of the bicycle business that the first boom in road-making that had been experienced in this country, finally took form in the middle 80's. The League of American Wheelmen and other bicycle organizations did valiant work in that direction, and the net result was the building of some thousands of miles of bicycle paths and the improvement of several thousands of other miles.

Windsor T. White, in 1904 and subsequently, developed Colonel Pope's idea by extensive "pathfinding" operations that served to broaden the use of the car to a material extent.

But the bicycle only served as an educator and a stimulant. The bicycle paths were not usable roads for other vehicles, save in a comparatively unimportant proportion of their mileage, and consequently did not serve a particularly wide purpose in themselves. But the taste of the fresh air and the beauties of the country became familiar to a large class that had never experienced either before. The bicycle planted seeds that since the planting have produced a bountiful harvest and give promise of much greater yields in the near future.

In 1800 it required ten days of tedious travel to reach Boston by road from New York, and it was not until the railroads were built that travel by land was practicable in this country for appreciable distances. In 1870 a land trip by road from New York to Philadelphia was about as serious an undertaking as a transoceanic voyage. Cer-

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ROY D. CHAPIN

President Hudson Motor Car Company. Official head of the Good Roads movement.

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tainly the latter was less arduous and trying from the physical point of view than the former.

The improvement in road conditions between New York and Boston and New York and Philadelphia would probably allow an extra good team of horses to make the Boston trip in seven or eight days, if they traveled hard and long each day. They could reach Philadelphia from New York in three days, representing three days saved on the Boston trip and two days saved on the Philadelphia trip, as compared with record figures of the past.

Road improvement, born of the automobile, is the sole cause of the increased potential powers of the horse. Of course, it is only potential, for no one has heard of any New York-Boston or New York-Philadelphia horse tours for many years, and it is extremely unlikely that any horse will ever again make either of those trips at limit speed. Such excursions would have nothing to recommend them and would inevitably bring down upon the heads of the persons responsible a flood of protest against the uselessness of subjecting a pet animal to such cruelty.

Under the influence of the bicycle certain short strips of highway were rolled and improved between 1880 and 1890. It was proposed to connect Chicago and Milwaukee by an improved highway and a few short strips of that road were built, but the sum total of road improvements, excluding bicycle paths and the territory within the limits of cities, was pitifully small.

The reason was this: There were 20,000,000 horses in the country, and despite bad country roads, which, according to the figures of the Department of Agriculture, made the cost of hauling a ton of freight one mile a fraction over 23 cents, the farmers were able to cultivate land that lay within six miles of a central shipping point and, by utilizing the strength of the horses, were able to make a moderate profit. Outside the six-mile zone the farmer had his labor for his pains, at least so far as shipment to market was concerned, for the haul at greater distances than five or six miles took all the profit out of the shipment. The Department of Agriculture estimated that the average profit on each ton of farm produce shipped to market was $1.38 and that the hauling item had to be deducted from that figure. Over poor, soft or dusty roads a twelve-mile trip, half under load, makes a four-hour job at the least calculation. If the wagon carried 3,000 pounds the margin within which profitable operation could be carried on at

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that distance would be $2.07. In such conditions where two trips could be made in one day, the total margin for hauling expenses would be $4.14. The wages and keep of the driver; the feed, shoeing and maintenance of the team and depreciation of team and equipment, as well as insurance and interest on the money invested, make quite sizeable items to charge against the $4.14 of profits, and show very clearly why the intelligent farmers of 1880 farmed land for shipping-produce that lay close to the central collection, or shipping points.

Improved roads in the country have extended the profitable shipping zone nearly one mile on either side of what was formerly the strip that could be used for money-making. In some favored localities the width of the zone is ten or eleven miles, but even with good roads, horse-drawn equipment reaches its ultimate limit at about that distance, which represents approximately a full day's work to make a single trip. The increased loads possible to haul over good roads, without using more power, measure the extra territory that has come under cultivation.

In the United States there are 2,312,000 miles of roads, such as they are. Of that mileage about 241,000 are classed as improved roads. Of the improved roads less than 50,000 miles can be designated as permanent, ballasted, graded, surfaced highways. The rest of the improved roads are simply those that have been graded, dragged and rolled, with the addition of top dressing and perhaps a binder in some sections. Upon the more than 2,000,000 miles of unimproved roads, in the country, state, county and local authorities and individuals have done much recent work. The common dirt road of 1870, impassable for months in each year and uncomfortable for the rest of the year, has been much improved since the automobile came along, although the improvement of such roads has not crept into the statistics as yet.

While there are only 241,000 miles of really improved highways, according to the latest reports, the fact has almost been lost from sight that the general average "unimproved" road of former years is much better than it was. The change has come about since 1910, when the first real distribution of automobiles began in the rural districts.

While the reports show that only a trifle over 10 per cent. of the road mileage in the United States is improved, in the restricted sense, the changes wrought within the past five years in the condition of the so-called "unimproved" roads, ought to be reckoned in some way and

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quite an extensive investigation leads to the conclusion that the roads as a whole are from 24 to 27 per cent. better than they were in 1880, the figures being reached, it must be admitted, from an investigation of only thirty-four localities, not included in the improved road territory.

Theoretically, this country never should have been a stranger to good roads, for as long ago as 1870 there was a pretty generally established custom that each adult male person should donate his labor and that of a team of horses for at least one day in each year to repairing and maintaining the roads. Away back in the days that preceded the railroads, keeping up the condition of the highways was something more than a theory, but it could never have been dignified by the term "practice."

The way this method had developed by 1870 was that a road tax was assessed against everybody, and in lieu of paying over the cash the residents of a township worked out the tax on the roads. In a township having a population of 200 men subject to the tax, a considerable amount of good repair work could be done on the main roads in one day. In less settled localities there would be fewer men but less road mileage to work, and in theory the plan of keeping up the roads was a beautiful, feasible thing. But it actually proved to be worth very little, because the energy was not applied with any general plan. The men and teams put in the time sufficiently well to satisfy the authorities, but it was not frequently recorded that any men or horses worked very far away from home during road tax day. A load of gravel dumped into a chuck-hole, a few scrapers of earth removed from the ditches and piled upon the surface of the road and a little packing and smoothing of ruts, and the whole work was accomplished.

A rain or two, a little hard traffic, and the work was undone, to remain undone until the next tax-day.

This system did not apply all over the country with equal force, or lack of it, but it was fairly average custom. Labor on culverts and country bridges counted as payment of the road-tax and on a labor-cost basis, some of the ramshackle bridges of the rural districts would make a hungry politician weep. There are numerous road-tax systems now in force throughout the country, but they are considerably different from the one outlined.

Convict labor has been used extensively, and with some good results, particularly in the South. It used to be a kind of axiom

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among the road builders that no great road could be built by freemen. They pointed out that military forces, utilizing the labor of prisoners to a large extent were used by the Caesars to build their great highways and consequently the idea of using convict labor is very ancient. Convict-built roads form only a minute percentage of the American highways, however, because there always has been a kind of prejudice against using that kind of work on public improvements in this country. One reason for the attitude is that where convicts work on the roads, there is less chance for an enterprising contractor to multiply costs for his own profit. In the days when there was a general, personal, road-tax and the system of financial assistance for road work, called as a general thing County Aid, the chances for a contractor were decidedly better, but when the various states shouldered part of the burden for road improvements, the counties standing the remainder, the contractor was in his glory and a lot of grafting politicians reaped a rich harvest.

In a recent publication of the National Highways Association, the statement is made that it is doubtful if half the money contributed by states and counties for road improvement ever actually reached the roads.

It is certain that it never produced good roads in the measure that it should. There are a variety of reasons to account for that condition, but chief among them must be mentioned the fact that even as late as 1910 road engineers, specialists in building highways, disagreed about the fundamental principles of construction. At the conventions of such experts it was quite a common occurrence to hear one speaker lay down a complete theory of road building and explain the practice of construction, step by step, from the ungraded road to the completed highway, and the next speaker, equally eminent in the special profession of highway building, would deny every material statement of the first and put forward diametrically opposed views as to what should be done to build a road.

Both were right and wrong. A road that is made to carry a certain amount of traffic in a certain climate will not stand up under ten times the traffic in a different climate.

But where there was apparently, at least, such a wide latitude of opinion among the experts, it is not at all strange that there should be some doubt about all their methods in the minds of the public. At any rate, the politicians and contractors took that view of it and

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HENRY B. JOY

Packard Motor Car Company. Known for fifteen years as the Militant Fighter of the Industry. Head of the Lincoln Highway Project and rated a leader for Good Roads.

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what has happened since 1905 in the United States constitutes one of the blackest, meanest pages in history.

New York State accepted the automobile as a serious commercial fact, long before other states. The people of the state voted $100,000,000 of bonds for improvement of the state highways. The money was spent; a few, very few contractors and politicians were put in jail, and the state has a lot of raveling macadam roads that will require maintenance and resurfacing constantly to keep them in passable condition.

Some of the blame for this condition should be borne by the contractors, some by the state officials, but in the main the trouble was more deeply seated than the broad general idea of paying a high price for road work. The kind of roads put in was wrong. The most progressive minds in the field of road-building unite in saying that for heavy mixed traffic, water-bound macadam is unfit, and yet New York State built hundreds of miles of water-bound macadam road since 1910 to carry heavy mixed traffic!

Bituminous macadam construction is not quite so fragile as the above type of road, but the combination of sharp-shod horses, standing water, a cold snap and then the swift passage of automobile wheels disintegrate it very readily. Two seasons of mixed traffic in New York, where constant repairs are not made, will take the surface from a bituminous macadam road quite as completely as it will disintegrate a water-bound macadam highway.

Something more substantial than either was required in New York. The authorities made a poor guess as to the character of construction needed, and in a comparatively short space of time the new roads, that should have been permanent improvements, will have to be thoroughly resurfaced and repaired at a cost of not less than $30,000,000. They will always be a source of expense until replaced by real roads, and the pitiful part of it is that the chances for getting an adequate bond issue for roads have been hurt immeasureably by reason of the waste of the first road fund derived from the sale of these New York bonds.

Ignorance, graft and plain incompetence have been common factors in road building since the demand for good roads became so insistent, due to the automobile, that the term road-maker included a vast army of much mixed elements.

Former Governor Martin Glynn of New York called attention

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to the waste of the road funds and accurately forecasted some of the results that in 1915 began to be noticed. He showed in one of his reports that costs for repairs on the new roads would soon amount to a stunning number of millions each year, and that in the end, after paying interest on the bonds and maintaining the roads, the taxpayers would have to liquidate the bond issue.

New York has paid heavily on account of the general desire in the state to have an adequate system of highways. The whole situation is one of the most discouraging things that has been marked in the progress of events from a condition of roadlessness to satisfactory highways.

In every other section of the country experiences that bear a resemblance to the fiasco in New York have been suffered. Possibly the degree of wastefulness has not been so pronounced in some, but it has been worse in others. Save for the size of the original expenditure, the experience of New York was not unprecedented—not even very unusual.

The National Turnpike, built early in the last century, from Cumberland, Md., through Pennsylvania, Ohio, Indiana and Illinois, was the first and only attempt of the Federal Government to stand sponsor for a highway project. The road was approximately 1,000 miles long and was used quite extensively until the day when railroads paralleled it. It fell into disuse and disrepair, and about 1840 was abandoned as one entire road. From the time it was built until the present parts of it have been in constant use, but in 1910, when interest in long permanent roads for automobile use was kindled, the route of the old National Turnpike was rediscovered, and since then it has been put in repair for a large part of its length.

It was built at various times and embraced quite as many different kinds of road construction as the experts have in mind to-day. The utility of the road never reached the expectations of its projectors, because the railroads came along and took away all reason for using the road for long hauls. It was much more economical to ship by railroad 100 miles than it was to haul freight over the roads, even if they happened to be good ones, for that or greater distances.

The L. A. W. started sentiment in the direction of improvement. Its members stormed legislatures and agitated the subject vigorously, but it was not until the automobile organizations became powerful and active that actual results were attained.

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It used to be taught in a certain school of philosophy that the end justifies the means; that a worthy object attained would excuse doubtful methods in the attainment. This reasoning applied to road improvement probably has as much right and justice in it as it ever had in any other phase, although the record of the road-makers bristles with incidents that are hard to justify in ethics.

In 1890 the L. A. W. discovered the fact that the poor downtrodden farmer needed good roads, and thereupon set about getting them for him, whether he happened to be enthusiastic on the subject or not. Perish the thought that the L. A. W. wanted the roads for bicycle use, when urging the poor farmer's need before the legislatures!

And when the automobiles began to make their appearance and motorists formed clubs and associations for mutual protection and the advancement of what they termed at the time "automobilism," the old L. A. W. argument cropped up again, and, despite the fact that no farmers possessed cars at that juncture, the motorists advanced many touching pleas before the legislatures for good roads so that the condition of the agriculturalist might be ameliorated.

During the period from 1902 to 1908 one of the most pungent facts encountered by motorists who braved the poor roads and used their cars in the country was that the farmer, about whom the motorists had exhibited so much eloquence and sympathy in urging the lawmakers to build good roads, was distinctly hostile to the motorist and quite suspicious of his motives.

The farmer did actually need good roads, just as he does to-day, but in his simple bucolic way he could not understand why the motorist was so solicitous on his behalf. His suspicions took the form of log-chaining certain roads to catch unwary motorists; of speed-trapping certain roads; of holding up fast-moving cars at the point of a shotgun, and in mulcting motorists outrageously for everything they were forced to buy during their trips.

And yet, whenever there was a dollar in sight to be spent for road improvement, the motorists were right there urging the need of the rural communities.

It was one of those exhibitions of unconscious humor that is much funnier to look back upon than to experience. The motorists certainly were loyal to the farmer in the matter of getting good roads for him, to say nothing of their own wishes.

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But the organizations of farmers, the National Grange and the Farmers' Union, recognized the opportunity and, disregarding the insufferable impudence of many motorists of that day and the spirit of bigoted intolerance on the part of many of their members, they co-operated effectively with the automobile interests to achieve the one great important object—good roads for everybody.

Successful propaganda was launched by dozens of commercial elements, including makers of road-building machinery, split-log drags, patented road material and even the crude oil interests; for they all saw a market for their goods in the movement that had the improvement of 2,312,000 miles of roads as its ultimate object.

The literature turned out by these concerns was very widely distributed, and it has proved to be a valuable educational force, although its main object was to further the commercial interests of the concerns that issued it.

By 1910 the safest, most popular and most constructive plank in the platform of any candidate for office was the one that pledged his efforts to the cause of good roads. He might be of any or all shades of political belief and at the same time advocate the improvement of the highways. He might be for stringent economies, in every other direction, but if he really wished to catch and hold popular attention, he was for liberal support of the good roads movement.

Since 1903, local, county and state listed expenditures for highway improvement have amounted to $1,800,000,000. A very considerable sum should be added to that vast amount to cover expense, labor and material put into the roads, but not accounted for in any bond issue, specific appropriation, or taxation. It should be noted that at least half of the work done on the roads and highways designated in the statistics as "unimproved" is not charged up against the definite appropriations. Therefore it is quite likely that the total road expenses from 1903 to 1915 was a round $2,000,000,000.

At the beginning of 1916 there were not more than 1,000 miles of adequate, permanent road in the country outside city streets—road built on a heavy foundation of concrete with a surface that will require little attention for twenty years. There were more than 20,000 miles of various kinds of macadam, representing a tremendous improvement over past conditions but inadequate, expensive and unsuited to mixed traffic. There were 30,000 miles of surfaced roads, some of it called macadam, prepared with oil, tar or asphalt binder, that afforded good

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traction, but which have to be constantly maintained. Approximately 190,000 miles of improved roads, some designated optimistically as macadam, are simply dragged and graded dirt and gravel roads upon which some sort of binder has been spread.

The remainder of the road system of the United States consists of dirt and gravel country roads and the coming of the automobile has had a potent effect on their condition. Local effort should be credited with a good part of the real improvement that is to be found in the average country road, because in spite of the graft, waste and incompetence it is wonderful that we have so much.

The items are rather interesting:

1,000	miles permanent highway at $20,000 per mile	$ 20,000,000
20,000	miles macadam at $12,000 per mile	240,000,000
30,000	miles surfaced roads at $10,000 per mile	300,000,000
190,000	miles other improved road at $2,000 per mile	380,000,000
1,000,000	miles country road at $200 per mile	200,000,000
	Total actual value of roads	$1,140,000,000

The cost of the roads was considerably more, representing everything in the nature of waste from incompetence to larceny and embezzlement.

The proportion of the annual output of automobiles sold to farmers has increased rapidly since 1910. In 1915 the factories of the industry found that a half by number, and over one-third by value, of the automobiles made by the industry went to farming districts, representing something like $250,000,000. The farmers are not buying the cars to keep in their barns, or to run wind-mills or milk the cows or anything like that. They are buying them to use on the roads, and one can look to the future with absolute confidence that the agricultural motorists are going to have passable roads.

To-day nobody is so blind as to question the economic value of good roads as a factor in commerce, but entirely aside from that aspect of the case, the farmer apparently has decided to be the biggest motorist of all, and he will see to it that he has a chance to use his car.

It was the recent improvement of country roads that stimulated the automobile market, and the continuance of the development in that direction will naturally insure an increasing volume of business that will make the current amount look small indeed.

Thus, the agitation begun in the good old bicycle days and fostered and nursed by the early motorists and stimulated by the propaganda

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of the commercial companies that had something to sell for road building, has blossomed out profusely. The farmer in whose interest all the tears of the bicyclists, early motorists and merchants were shed, has developed into the greatest force for good roads, and just incidentally the greatest market for automobiles.

The problem now before motordom is for more and better main highways, and the schemes before the public are numerous and comprehensive. Perhaps the work of the American Automobile Association in this regard is better known than that of any other element. The Good Roads department of the organization has been actively urging the betterment of state and interstate highways with effect since 1910. Its map department and road information have emphasized the need of a system of highways by the very limitations that the map-makers and road experts have been obliged to include in the elaborate maps produced by the organization. It is still almost a daily occurrence for the association to issue warnings to tourists to avoid a certain point, shown on the maps, and urging a detour, sometimes of many miles, because the main highway ends at the place specified, and the next link may not begin for ten miles or so; the gap being composed of primitive road that would endanger springs and render comfortable riding out of the question.

The Touring Bureau of the Automobile Club of America has the same experiences; so does the Blue Book and all other touring, road and map department activities, devoted to making the use of the automobile wider and more pleasant on the roads.

There are between 50 and 60 organizations of more than statewide scope in the United States that are working for national good roads.

Perhaps the project most closely associated with the automobile industry itself is the Lincoln Highway, designed to produce a good road from the Atlantic to the Pacific. Henry B. Joy, of the Packard Motor Car Company, one of the most aggressive men in the industry, is at the head of the association. The late A. R. Pardington, who was associated with organized motoring since pioneer days, was a moving spirit in this work up to the time of his death, and the idea has been supported widely by manufacturers, motorists and non-motorists all over the country. Carl G. Fisher was responsible for the Lincoln Highway idea, and it has worked out in such an interesting way that numerous other national road plans have been developed. One of the most important of these is the Dixie Highway.

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So far as actual road building is concerned, progress has been slow, but the route for the road has been marked out and is now passable. The completion of the highway is such a vast task that it may be several years before the last work is done upon it.

But the broad idea of having the national government build, own and maintain a system of interstate highways is the most interesting plan now being urged. The development of good roads has taken the following course: Back in the days when country road work was largely a matter of local activity, the citizens of a township sometimes got together and decided to improve the roads of their section, simply as a matter of economy. After their roads had been improved so that traction was possible upon them nearly all the time, in sharp contradistinction to conditions met in neighboring townships, they found that a good part of the traffic over their roads was through hauling, originating in some cases several miles outside their limits, and destined in some cases to points several miles beyond their territory. In time the volume of this "foreign" business became greater than the purely local traffic. Finally the progressive township, realizing that its efforts in road improvement were appreciated and used by outsiders for their own benefit, and fully understanding that the additional traffic was an excellent thing for the home folks, demanded of the county authorities that some sort of financial help should be accorded to them in their efforts to better road conditions. After while the county authorities saw the point and contributed a proportion of the road fund for internal improvements, in some cases. Then the good roads of the particular county began to attract traffic from other counties and the plan worked so well that the states were petitioned to aid in road construction by contributing to the counties.

The analogy may be carried on to apply to the National Government contributing to the states a certain proportion of the cost of building interstate highways, and in one way that has been done through the Office of Public Roads of the Department of Agriculture. In this department, road research is pursued on systematic lines and the department has been engaged in building object-lesson roads or samples of roads in various parts of the country since 1910. The only contribution the government makes in this way is in submitting plans and supervising the work.

But it should be noted that 'way back in 1900, when the practice of giving aid to township road building by the counties was fairly well

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established, abuses, involving graft, mostly of a petty character, began to be noticed. The county road funds administered by politicians proved too strong a temptation for some of these officers, with the result that there were few localities that got a full dollar's worth of road for every dollar spent.

The estimate of the National Highways Association is probably accurate enough when it sets forth that only 50 cents' worth of road was delivered for each dollar spent.

Under the broader plan of State Aid, the possibilities for ignorance, graft and incompetent administration to lessen the efficiency of the dollar as applied to road betterments, were much increased. In a country where we have so many political campaigns it is not a matter for wonderment that road funds probably supplied the thews and sinews for many a fierce battle of the ballots, to say nothing of feathering the nests of politicians and contractors.

State Aid, however, served a valuable purpose in one respect at least. It proved to be a link in the chain of development. Perhaps it was a mere expedient. Perhaps it was an uneconomic method of securing a worthy end, but it was a progressive step toward usable roads.

The legislative measures before Congress at the beginning of 1916, with prospects of success, providing for participation of the United States Government in the good roads movement, appear to be the entering wedges destined to open the way for a real era of good roads. The bills provide for an appropriation of $75,000,000, divided into five installments, annually; the first to be $5,000,000; second $10,000,000, and increasing $5,000,000 each year, until the last year provided for will see $25,000,000 expended by the government.

It is provided that these funds shall be apportioned among the states and that the states shall appropriate and spend an equal amount in the same districts where the government funds are spent.

Even the warmest advocates of these measures admit that $150,000,000, half contributed by the national government and half by the states, is only about enough to make a beginning. That amount, vast as it is, will only build 7,500 miles of real road, and it is not designed to build a single foot.

What it will do, if properly administered, will be to build up and improve the general traction. Properly handled, it can be made to

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convert 100,000 miles of ordinary country dirt road into the condition of dragged, rolled and graded highway, similar in every respect to the 190,000 miles of such highway existing at the beginning of 1916.

The addition of that amount of improved road would have an inestimable effect upon prosperity.

Merely to get an idea of what the effect would be in a single aspect, it may be said that the improved traction afforded by the roads from 1903 to 1913 added $50,000,000,000 to the value of land alone in the country according to government figures. The proposed extension of the road system will represent about 40 per cent. increase from the present mileage of improved roads. Judged by the foregoing, the new roads ought to increase land values $2,000,000,000 a year for ten years, which is quite an adequate return on the investment.

Amos G. Batchelder, Charles Thaddeus Terry, Roy D. Chapin, Henry B. Joy, Charles Clifton and the rest of the automobile industry should be credited.

The National Highways Association wants to have the government build, own and maintain a system of highways, 50,000 miles in length, connecting all the important cities of the country. It has estimated that the government could do this great work for considerably less than a cool billion!

Prior to 1914 a single legislative measure calling for the appropriation of a billion dollars, would have been referred to the Committee on Indian Affairs, or some other quiet peaceful body, but as the events of 1915 have shown that it is possible for belligerents to borrow hundreds of millions in this country on their plain notes, the possibility of funding a plan to build national good roads does not seem so wildly improbable as it did a short time ago.

While there was a good deal of noise made on behalf of good roads prior to 1903 which resulted in state laws to further the cause in New Jersey, Massachusetts, California, Connecticut, Maryland, New York, Vermont, Maine and North Carolina, it was mostly the cumulative effect of the L. A. W. agitation on top of the pressing requirements of the growing country to furnish better traction for horse-drawn traffic.

Almost everything that was actually done prior to 1903 has had to be undone. The commonwealths that participated in the movement are perhaps richer in experience, which is a good thing, providing the price is not too high, but the sum total of money spent prior to

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1903 on road improvements for modern traffic conditions may be charged up to education.

New York's educational bill for roads is large and recent, and so are those of many other states, but the lessons that have been learned since 1903 will have a valuable influence on the future.

If the history of any development ever proved anything, it would seem that the record of road development demonstrates the fact that whoever builds the roads should be solely responsible for them. Not that the fund should have several sources; the responsibility for spending it in several hands; the building divided among many contractors and the responsibility for maintenance resting nowhere in particular. There should be some plan by which the usual system of passing responsibility along to the other fellow can be avoided, and there should be some single person, department or government upon whose shoulders should rest the blame for fault or failure and upon whose brow the laurel of acknowledged satisfactory service could be placed.

The road, as part of the automobile, is a part of the defensive system of the nation. It is as much a military force as the navy or army and, according to the military philosophy of General Nathan Forrest, who raided the northern side of the Ohio River country with an inferior force and made a success of the operation during the Civil War, mobility is quite essential in troop movements. General Forrest said that according to his firm belief success in war depended upon getting the most men to a given point in the quickest time. With millions of automobiles in this country, that could be used to transport troops, the only thing that is necessary to multiply the power of an army, aside from the army itself, is a system of good roads.

Diverging into the military field a bit further, it may be said that the War College at Washington has studied out problems based upon the hypothesis of invasion, and has them all card-indexed and ready; and the following is not taken from the archives of that institution.

Suppose that the problem was this: The enemy has destroyed the fortifications around New York in fleet action, and the enemy fleet, held offshore by submarines, has bottled up our warships, so as to make possible the landing of troops. And suppose that 300,000 soldiers have invaded Massachusetts and 300,000 more have been landed south of Atlantic Highlands, N. J. The American army, numbering a round million, is drawn up around New York when information about the double invasion is brought to headquarters.

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If the American commander has 200,000 serviceable cars at his disposal and a comprehensive system of roads over which to run them, the problem of sending 300,000 troops to hold one invading army, while he overwhelms the other by mere force of numbers and then ships his victorious troops back to wipe out the second invader, is comparatively simple. But, unless the roads are available, this superior kind of mobility would be impossible.

The tactics of General Forrest have been amply justified in the great European War and probably will be considered fundamental military art from this time forth, as they were practical military practice during the Civil War. He, of course, labored under wretched road conditions and horse transportation, and was only able to demonstrate the quality of his strategy in a very limited way, but the main principle he enunciated is quite as true to-day and eminently more significant than it was when he delivered it.

Mobility is more important than mere force, and good roads are essential to the highest type of mobility.

At a time when the expenditure of a billion dollars for the purpose of military preparedness is being loudly advocated, and when it seems likely that a notable increase in military appropriations will be made, it would appear that the subject of national highways is pertinent. A system of national highways would add a degree of mobility to the military forces that would go a long way toward increasing their efficiency, and while such a system was working for defense from invasion that may never happen, it would be exerting a benevolent influence on all the citizens that measured in dollars would justify, if anything can, the wealth expended upon the increased military force.

A road system, owned, built, controlled and maintained by the national government even at a cost of a billion dollars would certainly add enormously to the economy of road transportation. It would add to real estate valuations; to the agricultural productivity of the country; to the shipment and manufacture of all materials, and to the exact amount that it stimulated travel on the roads, it would serve as a benefit to health, happiness and well-being of everybody who used it.

Admitting that increased military expenditures are unavoidable, without going into the merits of the proposition, the thoughtful minds of the country have suggested that an adequate appropriation be included in the military bill to provide for improved roads, so that

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the unavoidable waste that attends all military expenditures may be counterbalanced by the benefits that must follow the building of such a system of roads.

The project is of much importance to the automobile industry, because government roads would be good roads and the building of a comprehensive system would exert a powerful influence upon the volume of business. It would stimulate greater use of the automobile and would widen the sales. There is no hypocrisy about the automobile industry's attitude in 1915.

There is not the slightest doubt that the horse as an economic element in transportation is passing. There are 24,000,000 horses and mules in the United States and about 110,000,000 all told in the world. As power for road transportation they are out of date, but these animals and their predecessors are at the bottom of the whole trouble concerning road improvements to meet modern conditions in the United States.

The boasted roads of Europe were horse-roads. They were not designed, built or intended for motor traffic. There is no use covering the fact that the highways of France failed to stand up under the automobile. In this country the best streets and roads prior to 1905 were patterned after French and British ideas.

When the volume of automobile production reached such a stage that more roads were required, the builders produced more horse-roads. Every additional road appropriation right up to 1915 has brought into existence, not roads suitable for carrying modern traffic, but more horse-roads.

The builders seemed unable to rid their minds of the thought that the roads should be constructed to accommodate horse traffic, and therein lies the real reason for the waste of a large part that has been spent on the roads since 1905.

The horse able to make four miles an hour for twenty miles a day, six days a week and fifty-two weeks in the year, is absolute maximum in the way of horseflesh. As compared with a motor car of relatively indifferent efficiency, costing about the same as a pair of horses, harness and vehicle, the maximum horse performance needs no comment and can have no reasonable defense. And yet road engineers up to 1915, and perhaps some of them do still, considered horse traffic in laying out road improvements that should have a life of twenty years or more!

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The horse was in the eye and mind of the engineers, if not as the chief form of power to be used on the highways, at least as one of the principal elements and as a result many millions have been wasted in so-called road improvements since 1905.

The regard for horse traffic has checked and hindered the growth and development of the country by the exact amount of delay it has interposed to the production of real roads and the attendant waste of money.

At the beginning of 1916 the horse had all but disappeared from the large cities of the United States as a driving animal for personal carriage. The driving horse with its corresponding equipage first felt the competition of the automobile and yielded. The same trend is noticed in large towns and is spreading to the lesser communities. Since 1907 there have been few driving horses in New York, and in 1915 they were a rarity of enough interest to attract attention from pedestrians in the more popular lanes of traffic in the metropolis. The end of the carriage horse is definitely in sight.

The use of the horse in the cities has narrowed to delivery work and freight transfer. The horse has been eliminated as the motive power for fire-apparatus, and every season finds fewer engaged in delivery and transfer work.

The farming sections, which bought 300,000 automobiles in 1915, are quite as amenable to the rules of economics as the cities, and the introduction of that number of automobiles in one season into the rural districts means unquestionably that there are going to be more good roads in the country than there were before, and that with the additional good roads, horse traffic will be further limited.

And yet, the road engineers, knowing that road improvement follows and never leads improvements in the means of transportation, have continued to build roads to accommodate horse traffic, when the line of progress should have led them to base their improvements on the present rather than the passing forms of transportation.

They were led astray to some limited extent by the superficial reasoning of a few persons who, unfortunately, were in a position to influence the conclusions of the engineers. One of these men recently wrote a studied essay in which he predicated his whole argument touching upon the reason why the automobile made less early progress in America than it did abroad, upon the alleged fact that there were roads in Europe and no roads here.

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While the road is a part of the automobile, automobiles came before good automobile roads. In fact, it is quite apparent to the average person that there would be not a single foot of good automobile road in the world unless there was at least one automobile to use it. And it should be distinctly borne in mind that a good horse road is not a good automobile road, from any point of view. It was because that fact was concealed from the engineers and unrecognized by such men as the one referred to that the country has wasted millions of dollars since 1905.

The fact that the engineering devoted to highways has not been of the highest caliber led Roy D. Chapin to establish in 1915, in the University of Michigan, the scholarship of "Highway Engineering." The purpose of this is to facilitate the study of highway engineering in this particular university, and to stimulate interest in it.

The National Automobile Chamber of Commerce, which, with its predecessors has been active in promoting good roads since its creation, has started a census of the highway engineering courses of the technical schools of this country. The purpose of this census is to find what schools and colleges have established highway engineering, and to assist these institutions in securing the enrollment of students in these courses. It also contemplates a campaign in as many of the colleges as possible to add courses in highway engineering to their scholarships.

We must have better highway engineers to build good roads and to economically expend the vast sums that will be appropriated for this work in the years to come. "Hit-or-miss" methods can no longer be tolerated, or highway construction will prove to be a tremendous burden to the taxpayers.

The plain, unavoidable conclusion is that the automobile was the cause and the first-rate road the effect. The roads that existed at the time the automobile was born were horse roads. It is quite clear that it was the automobile that called into being the improved highway and not the improved highway that stimulated the production of the automobile, no matter how much it may have stimulated sales and prospects of sales.

There are several ways by which highway-making can be financed in this country, but the day has passed when any system of special taxation can be counted among them. Highways are one of the most valuable possessions of a nation, if not the most, and no argument is

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required on that point. They are valuable to user and non-user; to rich and poor; to the city dweller and the countryman. Everybody has a personal, tangible interest in good roads, whether he recognizes that fact or not.

As a national possession of universal interest roads can and ought to be charged against national and universal funds. The one that stands right at the hand of the world in general and the United States in particular, is the money that can be saved by eliminating the horse completely. It has been demonstrated that the horse cannot compete with the car as a means of economic road transportation, and therefore the horse should be eliminated in the cause of economy. The modern automobile can do everything that a horse is capable of, anywhere from three to ten times as quickly and well, and after that has power, speed and reliability entirely outside of the scope of the horse.

If all horses could be eliminated from road service and used for work on the farm, road transportation would be made better in proportion to the removal of the uneconomic factor. Productivity of the farms would be increased by the additional measure of cultivation that could be given. When the hydro-carbon engine is applied generally to cultivation work on the farm, the draught animal, having served his purpose to man, can be gracefully bowed off the stage and in a short time relegated to an honored place beside the Dodo or the mummy of Rameses in the great national museums.

Estimating the feed and keep of the average draught animal at $100 a year, the saving would be $2,400,000,000 a year on the one item, of which the feed element amounts to not less than half. That means that a vast quantity of grain, hay and fodder that now goes to maintain the horse in the United States, could be diverted to the maintenance of human beings, or for the keep of food animals.

The result, so far as one can forecast futurities, appears to be that the roads could be built to infinity out of the savings. That road transportation, free from the uneconomic and cumbersome service of animals, would be vastly swifter and better and cheaper. That meat would be more plentiful, due to the larger production and cheaper feed of food animals and that bread would be in greater supply at lower prices because of the lack of demand for horse feed, not compensated for by the increased production of meat-animals.

Out of the yearly balance that would remain from the economy of eliminating the horse to the last animal, an army and navy greater than

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any the world has ever seen in times of peace could be built, if desirable, and the rest of the fund might be applied to the retirement of the national debt and then the extinguishment of the state bond issues put out to fund the early automobile roads.

The grave importance of the whole problem of good roads is growing with every year. It is growing closer to the heart of every citizen of the United States.

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CHAPTER VIII

THE ROMANCE OF FINANCE

THE summer of 1915 was signalized by the entry of the submarine boat into the best graces of the world of finance. The early dream of Jules Verne has become an accomplished business reality, and its shares are bought and sold by investors with no more thought of undersea romance than if they were trading in groceries or dry-goods.

The automobile business has attained enormous stature. Bear in mind that a plant occupies only some few acres, and then observe how marvelously productive those acres become. There are several plants that will stand comparison with railroad systems of several thousand miles. The gross earnings of General Motors, for example, are greater than the gross earnings of the Chicago & Northwestern Railway and are about even with the gross earnings of the Burlington or of the St. Paul. Ford has more stock outstanding than the Lackawanna, and the market values of the two are not far apart. If the railroads could only borrow as little, proportionately, as the automobile concerns do, there would be no railroad problem in the United States.

The entrance of the motor-car into "Big Business" has been neither precipitate nor rapid. It has been a slow and, in the main, a steadily progressive occupation of the financial territory. In fact its record, when once admitted, has been noticeably good, for the entrance conditions have been unusually hard. Few industries have ever had to submit to such cold-blooded scrutiny. The automobile had to surmount these obstacles: (1) Not only was it a luxury, but it was so seductive a luxury as to lead people to mortgage their homes or take other thriftless steps, in order to buy it; (2) from a business viewpoint, the automobile was largely a gamble, depending (as it seemed) so much upon patents and upon the acceptability of this or that mechanical wrinkle to a captious, uninformed or undecided mass of buyers; (3) the years of its greatest development have been the years since 1907, when general lines of trade have been in doldrums or making heavy weather; (4) during these years, the financial world has been under heavy attack

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from politicians and selfseekers, and this fact, added to trade depression, operated against a cordial reception for a new enterprise likely to involve financiers in fresh possibilities of accusations of reckless behavior.

From a banking point of view, the motor car has passed through three phases:

(A) From about 1894 to about 1902, the experimental state. This period had virtually no relation to banking. Persons of red blood put up their own money for primitive plants and tentative trials of devices. A hideous proportion of these pioneers lost their "investment." In occasional instances, doubtless, local bankers gave financial accommodations to established factories that were experimenting in motor vehicles. But such accommodation was given on the general credit of the borrower, and not because of the manufacture of automobiles.

(B) From about 1902 to the summer of 1910. During this time the business began to assume a stable aspect. Automobile stocks and bonds were floated locally. The banks began to recognize the automobile trade as a real business, like other manufacturing, though rather more hazardous, and lending operations by local banks to motor-car makers became more usual. Sporadic instances of emission of automobile securities by New York bankers occurred, but these were mostly made direct to investor. Certainly motor-car bonds and stock were not dealt in on the New York, Philadelphia or Boston stock exchanges; nor did they enjoy, in the minds of bankers and investors, the prestige of railroads, public utilities or seasoned industrials.

(C) From the summer of 1910, forward. This precise period has been selected because it marks the time of the General Motors financing, by Messrs. J. & W. Seligman & Co., discussed at length below.

Since then the large financial centers have come to look upon the industry as established and worthy of large development. Its speculative nature is not lost sight of; every one realizes the chance or mischance residing in marketing a year's output to a rather fickle public. But certain manufacturing fundamentals have been demonstrated, the engineers can do what they promise, the essentials desired by the public are rapidly crystallizing, and the element of guesswork is approaching a minimum. The business is not so susceptible to rote and rule as are electrical utilities in cities, but it is no more speculative than certain textiles, and perhaps its most pronounced characteristic is

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that hard times seem to have no serious effect upon the demand for cars. The railroads suffer worse, relatively, in periods of depression than do the automobile makers. As an industry, this line of manufacture has many favoring conditions; competition is free and based on merit, so that no retribution under the Sherman Act or local anti-trust statutes need yet be feared; legislative regulation and taxation are not yet oppressive, and are, indeed, all things considered, practically negligible—unlike the railroads, the motor-car manufacturers are subject to no restriction of gross earnings. The tireless automobiles, pulsing about the country on a bewildering variety of business or pleasure errands, are fostering trade, giving health and promoting commercial and social intercourse so advantageously as to constitute an indispensable element in our Republic. The demand is there. So much the bankers *know*. The element of risk exists only in creating a supply acceptable to the demand. Thus the banking community may deal with the trade as a sound one, and the main problem is to select the wisest heads to choose (a) methods of manufacture and (b) character and price of output. Thus current conditions are no different from those prevailing in many other manufacturing lines.

The growth of automobile securities in favorable regard of investors has been, for the most part, creditable and induced by sound reasons. When due account is taken of the fact that the enterprise has been so largely experimental, the percentage of failures in motor-car concerns has not been disproportionate. And the experimental nature of the industry saved its securities from being widely held by investors. Only a few crashes have occurred that affected any substantial body of small investors. On the other hand, most of the big successes have been the property of a small group of persons—often only two or three. The flood of good clean money that nearly deluged some of these little bands of adventurers has directed public attention to the best side of the business, and the time is now ripe for it to take its place among other industries whose stocks and bonds are readily taken by investors. That time, however, might not even yet have arrived but for the courage, nerve, hardihood—call it what you will—of the banking group that sustained General Motors in its difficulties in 1910. At the least, the time would have arrived much later and the intervening financing of motor-car businesses would have been appreciably more difficult, but for that particular 1910 accommodation.

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Approaching the subject from its public aspects,[1] the three periods sketched above are now to be inked in with greater detail.

(A) From beginnings to 1902.

The president of the Dime Savings Bank of Detroit, speaking before the American Bankers' Convention in 1914, is authority for the statement that 1902 marks the real arrival of the motor-car industry, as a practical business, in the United States. Fewer than 1,000 cars were sold in 1902. Thus the year 1902 signalizes the end of the period of experimentation. Those who can recall the DeDion-Bouton factory, in the outskirts of Paris, in 1895 and 1896, will have a sufficiently accurate picture of the earlier American "plants." A structure scarcely larger than a modern garage in a large town, plus a small yard, with some installations for smithy work, shaping, boring and finishing, but wholly without foundry or other equipment for fabricating shapes or parts, made up the entire establishment, in which a few cars were laboriously put together under vexatious conditions of delay and change of design, for sale to a very limited group of purchasers willing to indulge the hope that the vehicles might some day prove themselves practicable and reliable.

Each of these primitive factories was financed from month to month by one or two or a few individuals fond of "taking a flier" or blessed with vision and optimism. In the nature of things, these struggling days left little or no record in the financial columns nor, it may safely be assumed, in the columns of bankers' ledgers.

Perhaps the most natural transition, least likely to give pause to a banker, was from the waning bicycle industry into these new self-propelled carriages. The best known instance is the Pope Manufacturing Company, which was founded February 27, 1903, to take over the American Bicycle Company and the American Cycle Company.

The story of the Electric Vehicle Company is told elsewhere in this book. It was incorporated in 1897, under New Jersey laws. In June, 1900, its capital stock was increased from $12,000,000 to $18,000,000. We find it in December, 1900, buying the Riker Electric Vehicle Company, which had been organized in 1899 and had $7,000,000 of stock

[1] For this reason, this chapter has been written mainly from newspapers, financial journals and other public sources, rather than from the books of the manufacturers or from other internal authorities. Not the merit of the industry or of any of its members, but the knowledge and attitude of the public respecting the industry, constitute the basis for the argument.

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($5,000,000 common and $2,000,000 preferred). In 1901 the Electric Vehicle Company stocks were:

	Authorized	*Outstanding*
Common	$11,000,000	$10,450,000
Preferred	9,000,000	8,125,000
Total	$20,000,000	$18,575,000

and in April of that year there were offered to stockholders 6 per cent. three-year bonds at 90, of an underwritten issue of $1,675,000. This was approximately 9 per cent. financing, a fair indication of conditions then confronting the company. In January, 1902, a mortgage was recorded to secure $2,250,000 of bonds, partly to take up the prior issue.

A by-product of the piping days of 1900-1902, when incorporation and consolidation were so active, is the record of charters taken out for motor-car companies. Some of them did a little business, some did none. The names of many of them are hardly memories to-day. The Horseless Vehicle Company, the International Automobile & Vehicle Company, and the Pneumatic Carriage Company, all with headquarters at New York, are among these reminiscences. Others were the Automatic Air Carriage Company (capital $600,000), organized in 1900; the Automobile Forecarriage Company (capital $5,000,000), formed in 1899; the Automobile Company of America ($4,000,000 common and $1,000,000 preferred), of which H. C. Cryder became receiver in 1902; the modest Manhattan Automobile Company ($50,000 preferred and $100,000 common); the Storage Power Company ($5,000,000 preferred stock), organized to develop the Prall Hot-Water patents, and the Woods Motor Vehicle Company ($2,500,000 preferred and $7,500,000 common).

Packard had begun in 1900 or thereabouts, but was not widely known in 1902.

Baldwin Motor Vehicle Company, a Cleveland concern organized in Ohio in 1901, had $600,000 stock, no bonded debt and claimed to make six cars daily.

The Stanley Electric Manufacturing Company was under way in 1900 at Pittsfield, Massachusetts. It had $1,001,000 of capital stock and its bills payable were inclined to exceed its receivables. But it kept increasing its capital, and in June, 1902, a majority of its stock was reported to have been purchased by a notable syndicate, with

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William C. Whitney, of New York, and Messrs. Dolan, Elkins and Widener, of Philadelphia, among its members.

Consolidated Rubber Tire Company (now Kelly-Springfield) was formed in 1899 in New Jersey. Its big growth came after a long wait, and is recorded below. Goodrich (original company, formed in 1880) dates from a co-partnership organized in 1870, presumably without much thought of "Silvertowns"; and U. S. Rubber began in 1892, likewise untroubled by visions of "Nobby" treads.

How great has been the mortality among these earlier incorporations is sharply marked by the fact that the only present-day survivor, out of those listed in the Manual of Statistics for 1902, is the Locomobile Company of America. It was formed in June, 1899, and, with John Brisben Walker's Mobile Company of America, manufactured Stanley steamers for a season. Its original $5,000,000 of capital stock has become $6,250,000 of common and preferred. It has resorted to borrowing to some extent, but its preferred has paid its full dividends much of the time.

This ends the period of beginnings, and we turn now to the eight years of "growing pains."

(B) From 1902 to 1910.

The earlier years of this period were booming, but panic came in 1907; and 1908, 1909 and 1910 were noteworthy mainly for the slowness and painful character of the recovery in business. But, somewhat paradoxically, the motor-car industry seems to have made its best strides in those deadly dull years. Certainly as a tried device, the automobile then took its place. And its substantial recognition as being worthy of loyal banking support also was won in the last four years of the eight years under survey.

Reo Motor Car Company began in August, 1904, at Lansing. By 1909 it grew to a point where it doubled its capital by declaring a 100 per cent. stock dividend. Its dividend record is worth studying, because the rate of cash dividend kept well up, notwithstanding successive dilutions of the stock, viz.:

	Cash Dividends	*Stock Dividends*	*Total Stock End of Year*
1905	10%		$ 500,000
1906	37½%	50%	750,000
1907	86½%	33⅓%	1,000,000
1908	80%		1,000,000
1909	70%	100%	2,000,000
1910	80%		2,000,000

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Packard is another sound, if quieter, development. The Packard Motor Car Company, first incorporated in 1900 in West Virginia, was, in 1909, supplanted by a Michigan company of the same name, authorized to issue $5,000,000 preferred and $5,000,000 common. Its fine product made it many friends. It was one of the first to sell securities to New York bankers, and perhaps *the* first to sell stock in that mart. In March, 1910, Messrs. Hayden, Stone & Co., the eminent copper bankers, placed $250,000 of 7 per cent. preferred at a recorded price of 110, or at better than a 6 1-3 per cent. basis.

Ford is mentioned only to forestall criticism of this work for incompleteness. The Ford Motor Company has no more relation to finance than Switzerland has to sea-problems. It was incorporated in Michigan in 1903. At an early date it conquered all inclination to be in debt. In September, 1910, it declared a cash dividend of 100 per cent. In 1910 it could have financed a number of other projects without feeling strain, but had no securities to sell through bankers.

Peerless was first organized in West Virginia in 1902.

The White Company, as the White Sewing Machine Company, began making motor-cars in 1901, and in 1909 began to build trucks.

The Pope Manufacturing Company went into the hands of receivers August 13, 1907. A new Pope Manufacturing Company was incorporated December 12, 1908, under the laws of Connecticut. Under the reorganization plan the old first preferred stock received 83 per cent. in new common stock and 75 per cent. in new preferred stock; the old second preferred stock received 20 per cent. in new common stock; and some of the common and new preferred were issued as a bonus with $800,000 of notes of the new company sold for cash at par. On July 31, 1909, there were outstanding $3,690,808 common, $2,198,202 preferred, and the last instalment of the $800,000 of 6 per cent. notes had been paid off on July 1, 1909. Dividends had begun to be paid against the accumulated preferred dividends and as regular quarterly dividends.

While their financial history belongs mostly in the third or present period, the second period saw these incorporations, which are interesting to ponder, viz.:

GENERAL MOTORS GROUP

Olds Motor Works, May 9, 1899.
Buick Motor Co., January 30, 1904.

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Carter Car Co., September 26, 1905.
Cadillac Motor Car Co., October 27, 1905.
Oakland Motor Car Co., August 27, 1907.
Elmore Manufacturing Co., October 20, 1909.
General Motors Co. of Michigan, December 28, 1909.

OTHERS

Hupp Motor Car Co., November, 1908.
Hudson Motor Car Co., 1909.
Everitt-Metzger-Flanders Co., 1908.
Peerless Motor Car Co., April 5, 1909 (successor to a W. Va. corporation of 1902).
Mitchell-Lewis Motor Co., January 15, 1910 (successor to Mitchell Motor Car Co. and Mitchell & Lewis Co., Ltd.).
Velie Motor Vehicle Co., October, 1908.
Toledo Motor Co. (now Willys), 1908.
Chalmers Motor Co., March, 1908.
Cole Motor Car Co., 1908.
Garford Co., April, 1905.

The Chalmers Motor Company succeeded, about 1907, to the business of E. R. Thomas Company.

Electric Vehicle Company became a great aggregation of varied lines, and prior to 1907 absorbed the New Haven Carriage Co., Siemens-Halske Electric Co. of Chicago, Pope Manufacturing Co. and Columbia Electric Vehicle Co. On December 10, 1907, Messrs. Barrett and Nuckols were made receivers in New Jersey and the receivership was extended to other jurisdictions where the company had assets. Though assets of over $14,000,000 were asserted, the company defaulted the interest on $1,521,000 of bonds and owed a total of $3,600,000 of indebtedness. So this great corporation, with $18,595,000 of capital stock outstanding, had to fall. It was reorganized July 1, 1909, as Columbia Motor Car Company, with $1,468,400 preferred and $929,800 common stock outstanding. The old bondholders received for each $1,000 face value $620 in preferred stock of the new company; the old preferred stockholders one share of new common stock for each twenty shares of preferred stock, and the old holders of common stock, on payment of one dollar per share, one share of new common

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stock of the new company for each twenty shares deposited. This scaling-down of securities shows the heroic measures adopted to put the concern into an appropriate earning condition.

A happier chapter is General Motors Company, with a New Jersey charter taken out in September, 1908. It soon ran its authorized stock up to $7,000,000 preferred and $5,500,000 common. It bought into Buick and Olds, and also into Oakland, Cadillac, Elmore and Rainier. By 1909, there were $9,000,000 preferred and $18,750,000 common outstanding. The first preferred dividend was paid April 1, 1909, and was 1½ per cent. A stock dividend of 150 per cent. on the common was distributed November 15, 1909. In December, 1909, stockholders were given the right to subscribe for $3,000,000 of new preferred at par (the authorized preferred having been increased to a total of $20,000,000 and the authorized common to $40,000,000). It was rumored in March, 1910, that $1,000,000 more of new preferred stock had been placed in New York, Detroit, Cincinnati and other cities. But the superficial symptoms were nevertheless that this well-planned company was hard pressed for working capital in the spring and summer of 1910, which is a tale reserved for the third period.

Among other corporations to which a brief reference may be made, and which had a recognized place by the close of the second general period under consideration, are Knox, Matheson and Paige-Detroit.

The Knox Automobile Company was a Massachusetts corporation of 1901. On July 22, 1907, the Company made an assignment to A. N. Mayo. Thereafter settlement was made in preferred stock for claims exceeding $100 and in cash under $100. The Company put out $494,700 of 8 per cent. cumulative preferred stock and $363,600 of common stock out of $500,000 of each class of stock authorized. An initial dividend on the preferred stock of 4 per cent. was declared October 23, 1909. The Company then had no bonds.

The Matheson Motor Car Company was incorporated in Pennsylvania in 1905 and succeeded a Michigan corporation. It had outstanding February 1, 1910, $355,780 of preferred, $613,000 of common and $154,200 of bonds. Its bank borrowings were also considerable and it went through a period of stress in the later period of the automobile business.

The Paige-Detroit Motor Car Company had a Michigan charter, obtained in 1909, and issued $100,000 of capital stock.

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(C) From 1910 to the present.

GENERAL MOTORS

The pre-eminent feature of real motor-car financing is General Motors. At the beginning of the summer of 1910, bankers were not cheerful over country-wide conditions. But to risk more money on a difficult venture, on proper conditions, evidently looked preferable to countenancing another big failure. The automobile business did not look any too enticing, on a general survey of the field, and the workability of the scheme of making assorted types of cars through one holding company was not a demonstrated success. U. S. Motors had been put together in February of that year, and was another untried combination. Studebaker and E-M-F were stirring. The big Ford dividends had not begun. Westinghouse Electric & Manufacturing Co. was recovering from its financial troubles. Bankers, the late James J. Hill and other great ones, were growling about extravagance, "cost of high living," prevention of loans to buy automobiles with, and so on. It was lumpy going, not only for new schemes but even for seasoned good ones.

So it was small wonder that the Messrs. Seligman and their associates made the terms fairly stiff. At the time, many criticized them as too harsh. But now (December, 1915) that the commonstock has sold above $500 per share, few are inclined to resent the extensive control that the bankers assumed over General Motors.

These are the bankers who are to be commended, *first,* for taking up the matter at all and, *second,* for making so liberal provision when the company might have scraped along with far less:

J. & W. Seligman & Co., Lee, Higginson & Co., and with them were understood to be associated Kuhn, Loeb & Co., and Central Trust Company of New York. The transaction took the form of the sale of $15,000,000 6 per cent. First Lien Five-Year Sinking Fund Notes, with the following features:

(a) Redeemable at 102½ and interest;

(b) Annual sinking fund, $1,500,000 in 1911 and 1912, $2,000,000, in 1913 and 1914.

But perhaps the most noteworthy element was the security. General Motors Company pledged pretty much everything that it had in the world: the stocks of all its subsidiaries, and first mortgage notes secured by all the real estate, plants, machinery and patents of Buick,

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WILLIAM CRAPO DURANT
President General Motors and Chevrolet Motor Companies. The financial Colossus of the Automobile Industry.

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Cadillac, Olds and all its other chief producing agencies. The General Motors stock was sealed up in a voting trust.

Finally, to help move the notes, a bonus of $200 par value of common stock (voting trust certificates) was delivered with $1,000 of notes.

These notes were the first automobile security ever listed on the New York Stock Exchange. They were admitted to list on June 28, 1911. They seem to have "stayed put" in the hands of their owners, for dealings have been light and the price-range high, even during these days of the World War. The records indicate as follows:

Year	*High*	*Low*	*Total Sales*
1911	99¼	97	$ 994,000
1912	100⅝	98½	1,623,000
1913	100	97⅝	1,325,000
1914	101¾	98½	1,680,000

The General has habitually anticipated a large part of its annual sinking fund payment and the purchase of notes for sinking fund has helped to keep the price up and to hold its credit in high esteem. By July, 1914, the Company could have paid all the notes then outstanding, and had $5,600,000 cash balance left! Such was the tremendous improvement wrought by the lapse of less than four years from the time of the big boost of 1910. In April, 1915, with $7,852,000, or about one-half of the notes remaining unpaid, the Company offered through Messrs. Seligman & Co. and Lee, Higginson & Co. to redeem all or any part of the notes. The notes were all anticipated, or provided for at maturity, and one of the most fruitful borrowings in history has ended.

Being out for records, the General Motors Company gathered in another. Its stock was the first motor-car stock to be listed on the New York Stock Exchange. On July 31, 1911, voting trust certificates for $14,418,500 preferred stock and for $15,785,700 common stock were listed. On March 11, 1914, additional amounts were listed, and on September 29, 1915, the Exchange admitted $18,038,400 of preferred and $19,874,000 of common, the voting trust being terminated. These certificates and stock have been until lately relatively quiet affairs on the floor of the Exchange, as this compilation will indicate:

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Year	Common High	Common Low	Preferred High	Preferred Low	Total Sales
1911	51¾	35	86⅝	74½	Com. 12,026 Pfd. 11,670
1912	42⅞	30	82¾	70¼	Com. 55,436 Pfd. 48,869
1913	40	25	81¾	70	Com. 30,003 Pfd. 18,372
1914	99	37⅜	95	70	Com. 162,457 Pfd. 70,649
1915	558	82	136	90⅝	Com. 347,052 Pfd. 111,588

General Motors has the further record of earning and paying the full 7 per cent. dividend on its preferred stock from the time of its incorporation in 1908. As to the common dividend, the directors awaited the retirement of the Seligman-Lee, Higginson notes, and began on October 15, 1915, with a 50 per cent. cash dividend on the common, or a disbursement of over $8,000,000. It had earned 81 per cent. on the common for the year. The common stock has paid dividends in 1916 at the rate of 20 per cent. per annum.

U. S. MOTOR CO.

Not long after General Motors, the unhappy United States Motor Company made the acquaintance of Wall Street. In February, 1910, the U. S. was launched by taking over control of Maxwell-Briscoe. Shortly afterward, the Brush Runabout, Columbia and Alden-Sampson were added. In June, 1910, the stock was increased, partly to facilitate the purchase of Dayton Motor Company (Stoddard-Dayton). In June, 1911, the authorized common stock was increased to $27,500,000. The need for working capital became more acute, and at about the same time the progressive house of Eugene Meyer Jr. & Co. formed an underwriting syndicate which enabled U. S. Motors to sell $6,000,000 of Five-Year 6 per cent. convertible debentures. These were offered to stockholders on the basis of allowing each stockholder to subscribe for $2,583.56 par value of debentures for each $10,000 par value of stock. In the following February, the preferred dividends were suspended, and in June, 1912, the principal bank and other creditors gave the company a 90-day breathing spell, and placed its affairs in charge of a chairman of the board of their own selection. Matters did not improve enough to avert more serious trouble, and on

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September 12, 1912, receivers were appointed. Reorganization plans had meanwhile been afoot, and an elaborate Plan and Agreement bearing date October 10, 1912, was promulgated before the receivership was many weeks old. The Committee went ahead vigorously. The sale of assets took place in January, 1913, and the new company was soon running briskly under its own steam. The size of U. S. Motors may best be seen from the figures submitted with the Plan, which disclosed these liabilities:

(1) Stock	$23,706,082	
Columbia stock	131,400	
Total stock		$23,837,483
(2) Real estate mortgages		164,540
(3) Unpaid accounts, etc		150,000
(4) Notes of subsidiary or selling companies endorsed		2,194,258
(5) Notes endorsed by subsidiaries		679,980
(6) Debentures and scrip		6,161,510
(7) Claims against U. S. Motor Co. only (not including claims against subsidiaries)		1,903,622
Total		$35,091,393

Under the plan, item (2) was left undisturbed, items (3) and (4) were paid, item (5) was paid as to claims actually established against subsidiaries and in other cases cared for with new securities, and items (6) and (7) were exchanged for new securities. In other words, roughly speaking, the mercantile creditors and lenders were paid, and the investors, one-name paper claimants and stockholders had to take new securities, and wait and hope. The debenture-holders received per $1000 debenture.

$500 new first preferred,
$500 new second preferred,
$400 new common.

Or a total of $1400 in par value of stocks of decidedly undetermined value. Some of the stockholders of U. S. Motor Co. were inclined to squeal at their terms, which were:

Paid Cash		*Received*	
Old preferred	$24.00	$24.00	First preferred.
		25.00	Second preferred.
		30.00	Common.
		$79.00	Par value.

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Old common	24.00	$24.00	First preferred.
		17.50	Second preferred.
		30.00	Common.
		$71.50	Par value.

But, as this is being written, the securities received are worth as follows:

Old.	*New. Securities.*
$1,000 debentures, worth	$1,085.00
$1,000 preferred, paid $240 assessment, worth	607.40
$1,000 common, paid $240 assessment, worth	565.00

MAXWELL MOTOR COMPANY

Thus, out of the ashes of U. S. Motor Company rose this brisk young phœnix. It was formed in Delaware, the well-known Adoptive Mother of Trusts (ever since New Jersey turned upon her offspring), in December, 1912. Its capitalization at July 31, 1914, was:

	Authorized	*Outstanding*
First preferred, 7%	$13,000,000	$12,279,332
Second preferred, 6%	11,000,000	10,127,468
Common	13,000,000	12,778,057
Total		$35,184,857

This looks, on its face, like a considerable watering; there is more stock to-day than U. S. Motors had of stock and debentures *together*. But —and it's a big BUT—observe that Maxwell has as much stock outstanding as U. S. Motors had of total liabilities of all kinds including stock; and that Maxwell *has no other liabilities worth mentioning*. All it "owes" is stock, so to speak. And it is beginning to show earnings that augur well for the stockholders.

On December 23, 1914, the New York Stock Exchange, on an unusually full showing of assets and liabilities, admitted to its list voting trust certificates representing all the issued stock. Dividends have been paid on the First Preferred, which is a cumulative stock, and has not yet received its full dividend accrued since incorporation. On October 14, 1915, notice of a meeting of voting trust certificate holders was given, for the purpose of increasing the authorized First Preferred by $1,050,000. The increased stock has been admitted to list.

The rise in quotations has been a pleasant sight for any one who is a bull on America. Observe:

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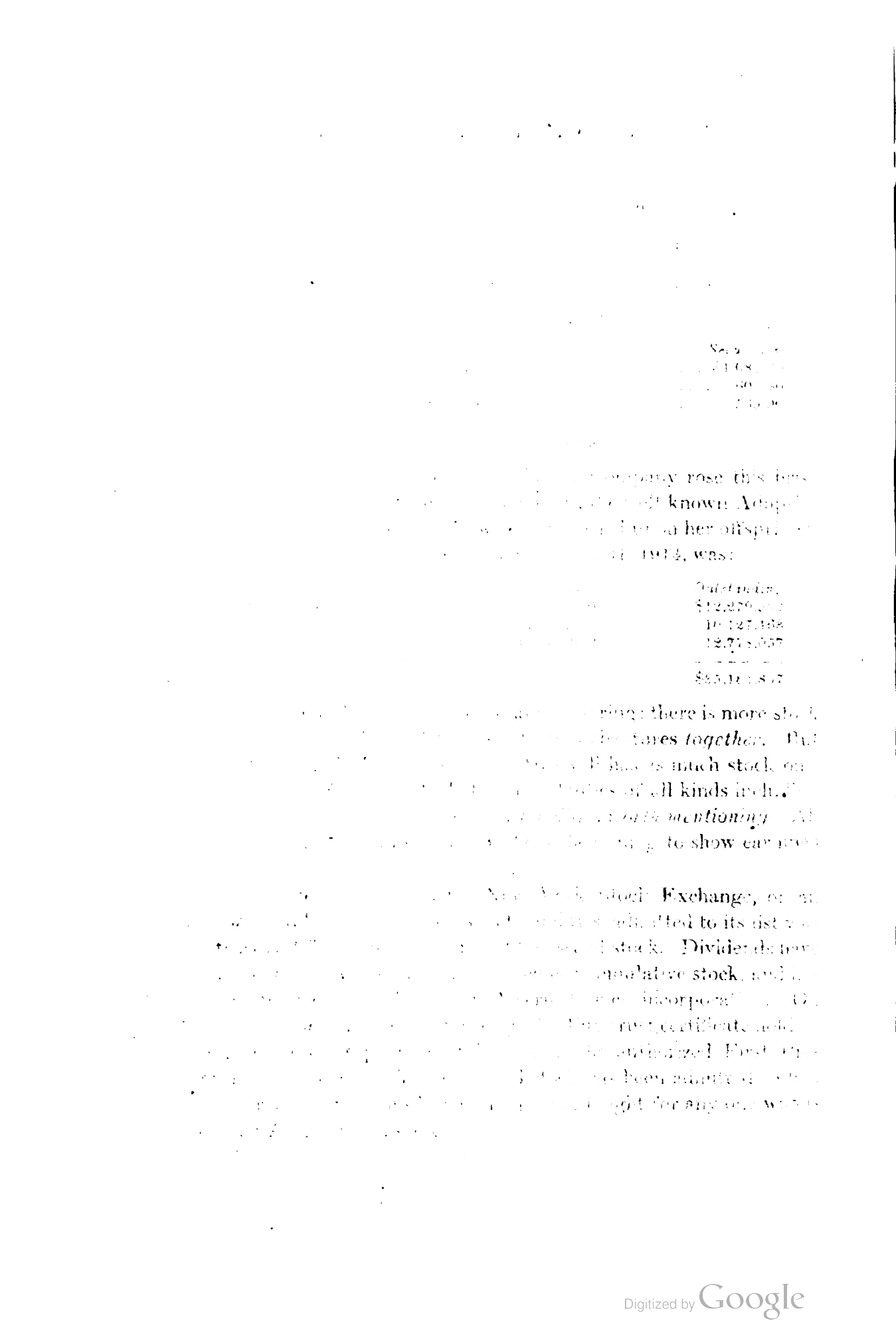

BENJAMIN BRISCOE

President former United States Motor Company. One of the pioneers in "Big Business."

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	First Preferred		Second Preferred		Common	
	High	Low	High	Low	High	Low
1913	35	18½	10¾	6	5	2½
1914	44	41½	17½	17	15¼	14½
1915	108¾	43¼	68½	18	92	15¼

The Maxwell Company is supervised by three Voting Trustees, whose efforts thus far have obviously been well-directed.

STUDEBAKER

The fourth automobile concern to have its stock listed on the New York Exchange (being the second, chronologically) is The Studebaker Corporation.

Nobody needs to be told of its earlier history, in the days of wagons and horsedrawn carriages. It made South Bend famous. The old Studebaker Brothers Manufacturing Company was established in 1852 and incorporated in 1868. Studebaker can thus claim to be the oldest concern engaged in the motor-car business. The present company (The Studebaker Corporation) is a New Jersey corporation of February 14, 1911. Its listing application in May, 1912, showed that the present company had taken over the properties of Studebaker Brothers Manufacturing Company and of Everitt-Metzger-Flanders Company (the latter having been incorporated in 1908). June 26, 1912, the Governing Committee of the New York Stock Exchange admitted to list $13,095,000 of 7 per cent. cumulative preferred and $27,931,600 of common stock. Its shares have quoted on the Curb and Exchange as follows:

	Preferred		Common	
	High	Low	High	Low
1912 Curb	104	94	59¼	34
1912 N. Y. S. E.....	98½	90½	40½	30
1913	93¼	64½	36	15¾
1914	92	70	36¼	20
1915	119½	91	195	35¾

There is thus convincing evidence that the Studebaker product is finding many friends, and that the work of its directors and bankers has not been in vain.

In its interim financing, the Morgan firm had a hand in connection with E. M. F. affairs in March, 1910. The note issue of $8,000,000 in February, 1912, was handled by Messrs. Goldman, Sachs & Co. and Lehman Brothers. These notes were to be retired serially up to 1922, but the bulk of the issue has been retired in advance, and the

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sale of $2,068,000 common stock (in treasury) to stockholders at 110, now consummated, will redeem all the notes, leave the company free of debts except current working accounts, and result in $22,500,000 of working capital whereof $6,500,000 will be cash.

WILLYS-OVERLAND

Once upon a time there was a Pope Motor Company, which turned into a Toledo Motor Company, organized in 1908. Also, a certain John N. Willys had in 1907 obtained control of the Overland Automobile Company, which was organized in Indiana and dated from 1905. In 1910 the Overland corporation was succeeded by The Willys-Overland Company, with an Ohio charter. Willys-Overland acquired the Toledo Motor Company, and in turn was superseded about November 18, 1912, by the present The Willys-Overland Company, another Ohio creation, which now owns

Garford Company (incorporated 1905), all common stock and about half the preferred stock;
Morrow Manufacturing Company, all the issued stock;
Federal Motor Works, all the stock.

Willys-Overland is a record of brisk and phenomenal success. It is barely seven years old. For the fiscal year 1908-9, it sold 3,081 cars; 1910-11, 15,384 cars; 1913-14, 44,654 cars; and selling 95,000 cars in the calendar year 1915. Regular dividends on the preferred have been paid since January, 1913; and 6 per cent. or more on the common since February, 1913.

Messrs. William Salomon & Co., of New York, have been sponsors for this company. It is one of the four motor companies to have its stock listed on the New York Stock Exchange; $4,721,000 7 per cent. cumulative preferred and $20,000,000 common were admitted to list February 10, 1915. Before listing, the Curb quotations ran in 1913 from 50 to 69¾ for the common and from 82 to 98⅞ for the preferred, on very meager transactions. Since listing, the preferred has quoted around and above par, while the common has been above 270.

The preferred has been subject to redemption, and by November 8, 1915, was reduced to $4,483,700. Notice has been given of a stockholders' meeting for some day in January, 1916, at which a program will very likely be consummated which includes (a) the retirement of

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all the present preferred at 110 and accrued dividends, (b) the issuance of $15,000,000 new 7 per cent. cumulative preferred stock (out of $25,000,000 to be authorized), convertible after 1916 into common stock on the basis of par for preferred against $300 for the common, and (c) the increase of the authorized common to $50,000,000. This rather ambitious program seems to be wholly justified by the Company's position. Messrs. Salomon & Co. organized a syndicate to underwrite the entire $15,000,000 of new preferred, which stockholders were allowed to subscribe for at 102½ to the extent of 71½ per cent. of their holdings of common and existing preferred. On December 18, 1915, Willys-Overland absorbed the Russell Motor Car Co. of Toronto. The New York Stock Exchange in March, 1916, authorized the listing of $15,000,000 of the new convertible 7 per cent. preferred cumulative stock on official notice of issuance in exchange for outstanding full-paid subscription receipts.

Thus, of the four listed companies, three are buoyantly prosperous and the fourth bids fair to be soon alongside of the other three. No other business represented on the New York Stock Exchange, it is confidently asserted, compares with this virtually 100 per cent. record of success.

CASE

A fifth concern which now sells automobiles enjoys a listing on the New York Stock Exchange, namely, the J. I. Case Threshing Machine Company. When it applied for listing on July 31, 1912, the nearest it came to mentioning motor-cars was "gas tractors," and, despite the present high place of the Case car, it does not rank strictly as an automobile manufacturer, and so has not been included with Maxwell, Willys, Studebaker and General Motors. On October 23, 1912, the New York Stock Exchange admitted to its list stock trust certificates for $11,289,500 preferred shares, with authority to add $710,500, or up to $12,000,000 total. The voting trust was renewed on the eve of its expiry, and on December 23, 1914, the Exchange listed $6,816,700 of the same certificates "stamped" to show the extension of the voting trust to January 1, 1918, with authority to add further "stamped" certificates up to an aggregate of $12,150,000. The company has $12,150,000 preferred and $8,300,000 common outstanding; also $10,500,000 first mortgage bonds, redeemable at 103, maturing annually $1,000,000 in 1915, $500,000 in 1916, 1917 and

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1918, and $1,000,000 thereafter. The voting trustees are Messrs. Francis L. Hine, William E. Black and Frank K. Bull. Quarterly dividends are paid on the preferred at 7 per cent. per annum. During 1915 the preferred has been traded in at from 74½ to 90⅛.

PEERLESS

Peerless will soon command even more attention than at present. The Peerless Motor Car Company (Ohio, 1909) has made quiet progress. It made a mortgage securing $1,100,000 6 per cent. first mortgage bonds in April, 1912, offered to the public at 102 and interest, by the Tillotson-Wolcott Company. In the fall of 1915, some $900,000 of these bonds were nominally existent, but provision to retire $300,000 of them had been made, and the new arrangements furnished actual cash to take care of the other $600,000.

Through Messrs. Shearson, Hammill & Co. of New York, acting for a powerful syndicate organized by Harrison Williams, Esq., the Peerless Truck & Motor Corporation was formed in Virginia in late October, 1915. The new Corporation issued $5,000,000 6 per cent. ten-year convertible notes secured by the stocks of the former Peerless Company and of General Vehicle Company, Inc. (New York, 1912) the latter manufacturing some 70 per cent. of the electric motor trucks sold in the United States and being understood to be controlled in the interest of the General Electric Company. The new Corporation also issued 200,000 shares of $50 par value. It is now in control of the Peerless and General Vehicle businesses. Prior to these arrangements, the Peerless common stock during 1915 sold from 20 up to 160 and the preferred from 50 up to 97½ on the Cleveland market, dividends on the preferred having been resumed July, 1915.

PACKARD

It has been recorded above that Packard Motor Car Company was one of the first to have New York banking support. In November, 1911, we again find Messrs. William A. Read & Co. extending the help of their noteworthy office and clientele to Packard, by selling privately $2,000,000 (out of $3,000,000 authorized) five-year 5 per cent. notes at about 98½, which was a good high price to receive at that time. The same firm had floated $1,000,000 additional 7 per cent. preferred stock at 108 and accrued dividends in the previous April, when the Company had no bonds except a $500,000 mortgage on its

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New York City real estate. In February, 1913, Messrs. Read & Co. purchased from the company and at once resold the remaining $1,000,000 of the above notes.

A 40 per cent. stock dividend in October, 1913, increased the common stock from $5,000,000 to $7,000,000. The authorized amount of common and preferred was increased to $8,000,000 of each. These notes now sell at par or better, the preferred sells around par and the common around 200. Messrs. Read & Co. have recently offered, at 104 and accrued dividend, $3,000,000 7 per cent. cumulative preferred stock, callable at 110 plus accrued dividend and redeemable at par on August 30, 1939. Packard's net current assets (at August 31, 1915) are reported as aggregating $10,000,000, and total tangible assets, less liberal depreciation, as exceeding $21,100,000. It is also reported that a 10 per cent. stock dividend and a 1¾ per cent. cash dividend are being distributed upon the common stock.

CHALMERS

The Chalmers Motor Company dates from March, 1908, and seems to have been so increasingly prosperous as to offer investments for sale, rather than to pose as a borrower. In August, 1910, it declared a 900 per cent. stock dividend and increased its common stock from $300,000 to $3,000,000. In October, 1912, a 33 1/3 per cent. stock dividend brought the total up to $4,000,000, and a 25 per cent. stock dividend in June, 1913, made it $5,000,000. The preferred stock, $1,500,000, was created in 1913, which the company persists in redeeming, so that around $1,100,000 of it is now extant. Messrs. Spencer Trask & Co., of New York, sold this preferred at 102½ and accrued dividends in March and April, 1913. The company is out of debt and pays its preferred dividends and 10 per cent. on its common. The stocks are dealt in on the New York Curb and the Philadelphia exchange.

WHITE

This careful and enterprising company would probably have had no occasion to call for financial partners but for the deaths about a year ago of Thomas H. and Henry White, two large stockholders. The present capitalization is being acquired by an Ohio corporation with $16,000,000 of stock in $50 shares. The old company has had no bonds outstanding and has paid 7 per cent. on $500,000 preferred

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and unpublished rates on $2,450,000 common. The 1915 net earnings were reported as $8,000,000. These important New York interests are represented on the new board of directors: Messrs. J. Horace Harding, of Chas. D. Barney & Co.; Theodore Roosevelt, Jr., of Montgomery, Clothier & Tyler; E. R. Tinker, of the Chase National Bank; A. M. Hall, of the Liberty National Bank. The survivors of the fine group of Cleveland men identified with the company's growth evidently are expected to continue with the new company.

The record of other buoyant motor-car manufacturers is nearly as long as Homer's Catalogue of the Ships. A bare enumeration must suffice in most instances.

Hornblower & Weeks, active New York bankers and brokers, have managed two promising concerns in the last few months. The first was Chevrolet Motor Company, the stock of which was underwritten about October 1, 1915, at 85 and privately subscribed far in excess of the amount available; $20,000,000 of common stock were sold or exchanged for constitutent properties, and the company has no bonds nor preferred stock. It is managed by men identified with General Motors. Current earnings indicate 10 per cent. on this stock. On December 23, 1915, the stockholders voted to increase the stock from $20,000,000 to the huge total of $80,000,000 and authorized the directors to issue new Chevrolet stock for General Motors common stock on a basis not to exceed 5 shares Chevrolet for 1 share of G. M. common. About 50 per cent. of the G. M. common is expected to be acquired. W. C. Durant is understood to be managing this proceeding. The Chevrolet stock has been listed on the New York Curb since March, 1916, and has quoted above 250.

The other Hornblower & Weeks flotation is Chandler Motor Car Company, an Ohio corporation chartered in December, 1915, $7,000,000, of which $4,800,000 was sold at 85, and was reported to have been twelve times oversubscribed. The original company was formed in Ohio in January, 1913, with a modest capital ($200,000 7 per cent. preferred and $225,000 common), had no bonds outstanding and paid 17½ per cent. dividends on the common in 1914. Not a bad showing for a two-year-old.

At this point we bring Ford down to date. It is understood to have declared a 500 per cent. dividend in June, 1913, and 100 per cent. extra dividend in May, 1914. A 2400 per cent. stock dividend in June, 1915, increased the stock from $2,000,000 to $50,000,000.

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Meanwhile, Ford Motor Co. of Canada, Ltd., was incorporated in 1911, with a capital of $125,000. A stock dividend of 700 per cent. in 1912 was reported. In October, 1915, a 600 per cent. stock dividend was authorized. Prior thereto, five-sixths of the liabilities of the company consisted of surplus. A little of the stock, carrying the expected stock dividends, was privately sold by prominent New York bankers at an almost fabulous price.

Reo has kept up its dividend gait. Recent history shows:

	Cash Dividend	*Stock Dividend*
1910	30%	
1912	20%	
1913	15%	
1914	37½%	50
1915	15% plus.	

The company has no bonds outstanding, and seems to get on without Eastern banking affiliations. The 1914 stock dividend brought the stock to $3,000,000, and recently another $3,000,000 stock dividend was distributed, making the total stock now $6,000,000.

Hudson is another such. Hudson Motor Car Company was organized in Michigan in February, 1909, with $100,000 stock. A 900 per cent. stock dividend in November, 1910, brought it up to $1,000,000, and a 100 per cent. stock dividend in August, 1913, made it $2,000,000 in all.

BAKER R. & L.—OWEN—ENTZ

A technical development of great interest will probably come from this group of enterprises. The Baker R. & L. Co. was organized about June, 1915, as the amalgamation of two leading makers of electric pleasure vehicles, the Rauch & Lang and the Baker. The new company determined to produce a gasoline-driven car without shifting gears, obtaining clutch and transmission through electric devices. The company is paying regular quarterly 1¾ per cent. dividends on $500,000 preferred and on the common, and on January 1, 1916, a stock dividend of 8½ per cent. on the common was also made. The stock, as thus increased, is deemed worth from 120 to 130. The General Electric Company, or interests identified with it, are reported to have made an important purchase of common, amounting to $1,000,000 par value of stock, upon which the capitalization will become:

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Preferred		$ 500,000
Common—		
December 31, 1915	$1,382,000	
Stock dividend	118,000	
G. E. purchase	1,000,000	
		2,500,000

Meanwhile, there was incorporated in New York during December, 1915, the Entz Motor Patents Corporation, primarily to own the electric transmission patents of Mr. Entz, a native of Cleveland, Ohio. The Entz Corporation also bought the Owen Magnetic car plant, but finding it too small to fill the growing demand, has bought a substantial interest in the Baker R. & L. Company, presumably all or part of the $1,000,000 of Baker R. & L. common above mentioned. The Owen Magnetic car will thus be made in the Baker R. & L. plant. The Entz Corporation has outstanding voting trust certificates for $718,000 of 7 per cent. cumulative preferred stock callable at $115 per share, and $5,000,000 common of which the floating supply seems to be small and which already quotes at 50 bid, 60 asked. The officers and directors include two high officers of the General Electric Company, a prominent chartered accountant, Richard H. Swartwout of Swartwout & Appenzellar; R. M. Owen and Roy A. Rainey.

LA FRANCE

An important illustration of the adaptability of the automobile to diversified functions of peace and war is furnished by the American La France Fire Engine Company, Inc., which produces fire engines, water towers and hook-and-ladder trucks, mounted on motor-cars, and also is prepared to furnish a war-truck steerable from front or rear delivering power at each weel. Upon $2,000,000 of preferred stock it is paying 7 per cent. and will shortly pay its fifth quarterly 1 per cent. on the $1,450,000 common. A strike impeded the company last summer.

International Motor Company has had loyal backing from New York bankers. It was created in Delaware in October, 1911, as a combination of Mack Brothers Motor Car Company and Saurer Motor Company, both building trucks. Messrs. E. B. Smith & Co. and Pomroy Brothers financed the company at that time. Some $2,815,000 of 7 per cent. preferred was offered at 97½ in November, 1911. Later the company acquired the Hewitt Motor Company. In April, 1912, Messrs. E. B. Smith & Co. offered additional preferred

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F. C. CHANDLER
President Chandler Motor Car Company.

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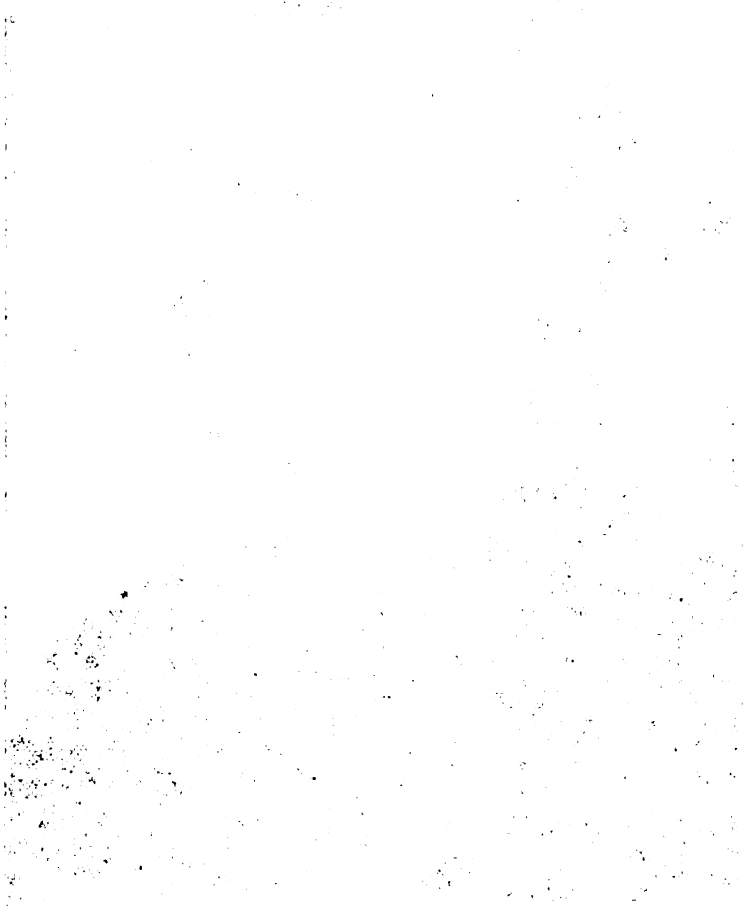

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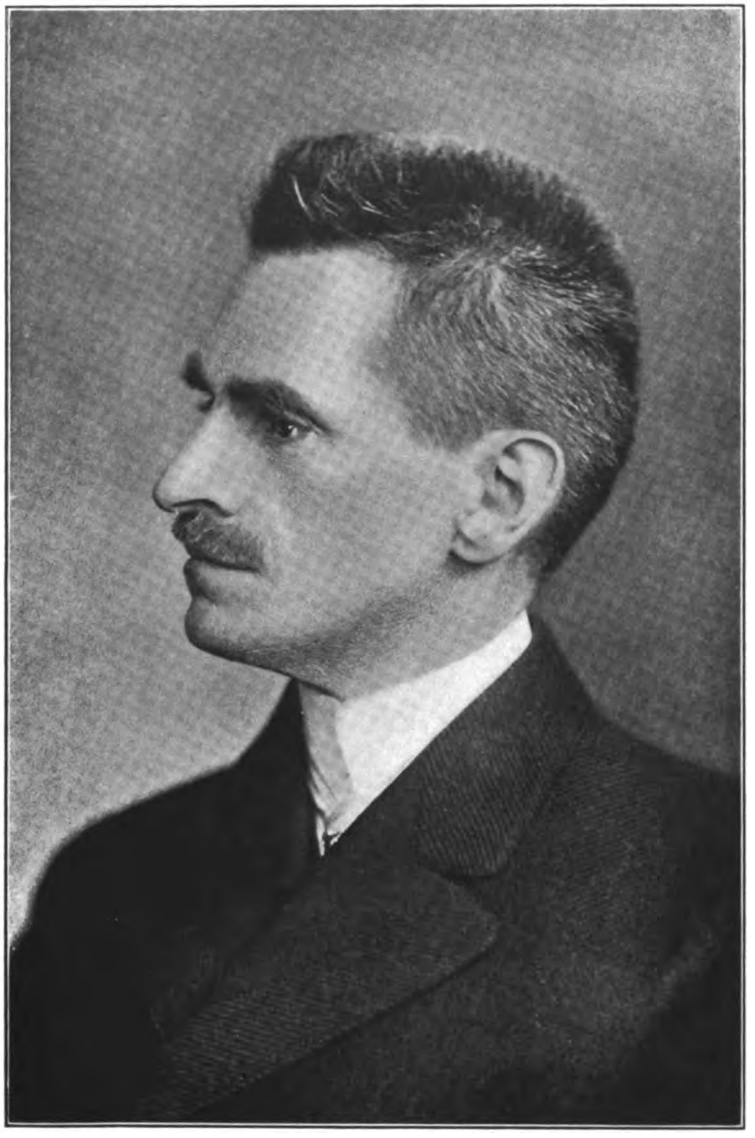

W. M. ANTHONY

Maxwell Motor Company. Pioneer in introducing scientific business methods in Automobile Industry.

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at a price below par. In December, 1912, large stockholders loaned $1,500,000 to the company, secured by control of its stock; the stockholders were asked to surrender 55 per cent. of their holdings to the lenders, with the privilege of subscribing to the loan and receiving 200 per cent. of the amount so loaned in common stock. That better business at home and abroad is steadily strengthening the company is evident from the fact that the common stock has travelled from 2¾ up to above 35, and the preferred from 18 to above 75, in the year 1915.

The Hupp Motor Car Corporation has lately had the financial co-operation of Messrs. Ladenburg, Thalmann & Co. and A. G. Becker & Co., who offered at 102 and accrued dividends some $1,500,000 of 7 per cent. cumulative convertible preferred stock. This is on the basis of 6.86 per cent. yield to the investor. The old Hupp dated from 1908, with a capital of $11,000. The present Hupp was formed in Virginia in November, 1915, and took over the old Hupp and the American Gear & Manufacturing Company. There is no bonded debt. Besides the above preferred stock, there is $5,000,000 common stock outstanding and $1,500,000 additional common is held for conversion of the preferred at par for par.

Locomobile sold, through Messrs. Spencer, Trask & Co., in July, 1912, $1,500,000 of its first mortgage ten-year 6 per cent. bonds at 98½ and interest.

Lozier dates from 1911. In March, 1913, it offered new 7 per cent. convertible preferred to stockholders at par. September 23, 1914, receivers were appointed. To January, 1916, creditors received 12½ per cent. of their claims. The Associated Lozier Purchasers, Inc. (Michigan, March, 1915), took over Lozier at sale of its assets. The Plattsburgh plant has been sold, and manufacturing concentrated at Detroit. The reorganized corporation has excellent prospects.

Mitchell-Lewis Motor Company, of Racine, Wisconsin, has had competent banking friends. Messrs. White, Weld & Co. and Geo. H. Burr & Co. bought and resold in November, 1911, $2,500,000 of 6 per cent. notes, at the prices of par and interest for $750,000 due August 1, 1912, and 98½ and interest for $1,750,000 due August 1, 1913. In July, 1913, Messrs. White, Weld & Co., with others, placed $1,500,000 6 per cent, one-year notes at 98 and interest.

Marion Motor Car Company was incorporated in Indiana in May, 1912, and issued $400,000 common stock (of $750,000 authorized)

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and $200,000 6 per cent. preferred stock (of $500,000 authorized) and had no bonds at the last report (1914).

The Pope Manufacturing Company December 23, 1912, was reincorporated in Massachusetts with the same capitalization as before, and stock was exchanged dollar for dollar. The regular preferred dividends were kept up until July, 1913. The company brought out $1,000,000 of two-year 6 per cent. notes bearing date April 1, 1912, at par and interest. On October 27, 1913, Mr. George Pope was appointed receiver in Connecticut, and on December 4, 1913, he and Charles A. Morss and Charles A. Persons were appointed receivers in Massachusetts. The receivers have been authorized to sell the assets. Dividends to creditors on proved claims have been: September, 1914, 10 per cent.; January, 1915, 25 per cent.; March, 10 per cent.

Matheson has to be recorded for some misfortune. On December 20, 1912, receivers were appointed. Liabilities were estimated at $600,000 and assets as exceeding $1,000,000.

Cole Motor Car Company dates from 1908, is an Indiana corporation and has $700,000 (out of $1,000,000 authorized) of stock outstanding, and no bonds according to last advices.

The Consolidated Motor Car Company was chartered in August, 1910, in Ohio with $2,000,000 each of preferred and common. Messrs. H. A. Willis & Co., of New York, offered $250,000 of preferred to the public at par, with a 100 per cent. common stock bonus, in April, 1911.

The little Saxon car was reincorporated into the Saxon Motor Car Corporation on November 24, 1915, in New York. Only one class of stock was issued, $6,000,000 of it, which Messrs. Merrill, Lynch & Co. stated was oversubscribed at 75, the offering price.

Velie Motor Vehicle Company has been producing at Moline, Illinois, since, 1908. It has issued $400,000 common, $400,000 preferred and $124,000 of first mortage serial 6 per cent. bonds, dated 1911, maturing about $40,000 per year each March 15th from 1916 to 1919.

The Paige-Detroit Motor Car Company has been making unostentatious progress. In the summer of 1915 a 100 per cent. stock dividend was paid from surplus. There are only about 18 shareholders. The cash dividends during 1915 have aggregated at least 49 per cent.

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AMERICAN and PREMIER

Certain of the smaller and more local manufacturers have gotten into financial difficulties, and the fact that such mishaps occurred has developed a demand for what may be termed an automobile factory "trouble-man." As an illustration of the best equipped men for "picking up a wreck," we cite the history of Frank E. Smith. Educated in the factory of what is now the American Locomotive Company, at Providence, he conducted for three years the big New Castle, Ind., factory of the Maxwell-Briscoe (U. S. Motor) Company. In 1913 Mr. Smith became vice-president of the American Motors Company (Indianapolis) in an endeavor to save the concern, which, however, was past saving and he was made receiver in November, 1913. He succeeded in reducing its liabilities, selling the physical assets for 20 per cent. more than the appraised value, and realizing for creditors approximately 18 cents on the dollar, where they had feared that they might not get even 8 cents on the dollar. In October, 1914, the Premier Motor Manufacturing Company went into bankruptcy, and Mr. Smith was selected as receiver in bankruptcy by Federal Judge Anderson, of Indianapolis. The court allowed him to manufacture and market Premier cars, from which, in spite of an expensive fire, he made a comfortable profit. The old Premier Company had $500,000 of assorted common and preferred stocks. The new Premier Motor Corporation, being the reorganized company, of which he is a director, has a capitalization of $1,000,000 of preferred and $1,500,000 of common stock. Thus, operations even under bankruptcy have evidently been sufficiently promising to induce financial people to take the Premier out of court in the expectation of large scale production.

PERLMAN and UNITED MOTORS

In April, 1916, were offered the shares of Perlman Rim Corporation, organized by Louis H. Perlman, the inventor, W. C. Durant, L. G. Kaufman, president of the Chatham and Phenix National Bank of New York City, and others, to own and develop the rim and wheel patents awarded to Mr. Perlman in February, 1913. The patent had stood the test of court proceedings. The circular of Messrs. Gwynne Brothers stated that $3,000,000 cash had been paid into the treasury and that rims were being manufactured for Willys-Overland, Stearns, Fiat and Chevrolet, with other contracts under

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negotiation. The stock of the Perlman Rim Corporation is all of one class, comprising 100,000 shares of no par value, whereof 3,000 shares have voting power and 97,000 shares have no voting power. This stock has quoted on the New York Curb at around $140 per share.

In June, 1916, the Perlman enterprise went into a very important combination, known as the United Motors Corporation, which has issued 1,200,000 shares of no par value, of which 5,000 shares have voting power and 1,195,000 shares do not possess the right to vote. The United Motors Corporation was organized to control, by stock ownership, the Perlman Rim Corporation, the New Departure Manufacturing Company, a manufacturer of annular bearings, the Hyatt Roller Bearing Company, the Dayton Engineering Laboratories Company, the well-known "Delco" builder, and the Remy Electric Company, which specializes in ignition devices. This stock is quoting on the New York Curb "when issued" at around $80 per share.

Another recent amalgamation of concerns engaging in manufacturing motor-car parts and accessories is the Motor Products Corporation, organized under the laws of New York on June 5th, 1916, with 100,000 shares of no par value, whereof 5,000 are designated as class B, with voting power, while the remaining 95,000 have no voting power, but all shares are otherwise alike in participating in dividends, assets, etc. All stockholders, however, will have the right to vote if the company fails for two consecutive years to earn at least $5 per share per year on all its outstanding stock. The consolidation includes the Rands Manufacturing Company, Diamond Manufacturing Company, Vanguard Manufacturing Company and Universal Metal Company of Detroit, and the Superior Manufacturing Company of Ann Arbor. This new company is to have no mortgage or funded debt and no liabilities excepting current bills. It is to be managed by the active officers of the constituent corporations and by Sol Wexler, of Messrs. J. S. Bache & Co., who have reported the sale of 50,000 shares of stock acquired by their syndicate.

The host of other automobile manufacturers that might be mentioned do not appear herein only because their financial affairs have not been recorded in any available journals. Some of the most noteworthy cars have managed their finances most inconspicuously. Pierce-Arrow, Stevens-Duryea and Stearns appear to have had no public financial transactions whatsoever. Of Winton, it is known that it has no bonds and $1,000,000 stock outstanding. Franklin has about $95,-

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000 bonds and $132,950 preferred and $900,000 common stocks outstanding, paid above 50 per cent. cash dividends in 1915 on the common and a 100 per cent. stock dividend was distributed on the common December 31, 1915. Autocar resumed dividends with a 5 per cent cash payment December 31, 1915, upon $1,000,000 of stock, and turned $400,000 accumulated surplus into capital stock through a 40 per cent. stock dividend. Dodge Brothers laconically state that during their first year, 1915, the public has "bought more than $35,000,000 worth" of their cars. The Grant Motor Company (Findlay, Ohio) is being recapitalized at $4,000,000 ($1,000,000 preferred, $2,000,000 common to be issued by Messrs. Andrews & Co. and Livingston & Co., of Detroit. The Standard Steel Car Company (Pittsburgh) is building a Standard automobile. Of the Interstate, it is known that it is managed by two American household words, the Ball Brothers Fruit Jar people and the Hoosier Kitchen Cabinet group.

Alco and Stevens-Duryea are two sterling products that have been discontinued from market considerations, as their producers viewed them.

No adequate record has been available of the financial history of many other makes whose characteristics and "personalities" are known to thousands of users. They defy enumeration. Among them are Anderson, Apperson, Auburn, Briscoe, Daniels, Dort, F. I. A. T., Kissel, Kline, Grant, Lexington, Marmon, National, Pathfinder, Pilot, Pullman, Scripps-Booth, Stutz, Touraine.

SUMMARY

Several interesting tendencies are disclosed by the financial records of motor-car companies: (1) Bonds are the exception, not the rule, probably because it is hard to sell bonds against factory property until it is in big producing condition, and in that condition it can finance without resorting to bonds. (2) Financing is done upon earning power, not on capital assets, for the most part. (3) Bonds and preferred stock are usually serial or redeemable, especially where bankers have had to do with them. This is a recognition of the fact that ups and downs are likely to occur, and hence that anything ahead of the common stock, in the interests of conservatism, should be retired as fast as possible. (4) The need for ample working capital, and the quick response of the industry when adequate capital is raised. (5) Stock

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dividends are of frequent occurrence, showing the enormously rapid expansion as soon as a business gets a stable foothold.

Finally, it is evident that the experience of bankers with automobile companies have given them, on the whole, satisfaction and grounds for optimism. They will finance automobiles more widely in the future, and the nation's stock exchanges and investors will come to know their securities familiarly and favorably.

THE TIRE MANUFACTURERS

Tires are the boot-and-shoe trade of automobiling. Hence they constitute a staple line. But one chief ingredient, rubber, is consumed in countless other ways. Thus the rubber business antedates the motor-car and is to a great degree independent of it.

GOODRICH

The B. F. Goodrich Company, for example, began in 1870 as a partnership. Its expansion began before automobiles were generally used. Its former Ohio corporation started in 1880 with $100,000 capitalization, and increased it, on the dates following, to the aggregate amounts shown:

July, 1882	$ 200,000	July, 1899	$ 3,000,000
July, 1889	500,000	July, 1903	5,000,000
January, 1891	750,000	January, 1906	10,000,000
January, 1895	1,000,000	August, 1910	14,000,000
July, 1895	1,500,000	1912	16,000,000
July, 1896	2,000,000		

There were stock dividends in 1906, 1911 and 1912. On May 2, 1912, the present B. F. Goodrich Company was incorporated in New York. After taking over the Ohio Goodrich Company, it soon acquired the Diamond Rubber Company (originally a West Virginia corporation of 1894, then Ohio from 1905), which had a similar record of expansive growth. Diamond's stock outstanding had been thus:

1905	$ 3,500,000
1907	5,000,000
1909	10,000,000

Diamond paid a $500,000 stock dividend in 1907 and a stock dividend of 100 per cent. in 1909. On August 27, 1912, the New York Stock Exchange admitted to list $30,000,000 7 per cent. cumulative preferred

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and $60,000,000 common stocks, which have quoted during 1915 from 95 to 114½ for the preferred and from 24½ to 80¼ for the common. $2,000,000 of the preferred has been retired under a provision requiring 3 per cent. of the preferred to be purchased for sinking fund annually.

U. S. RUBBER

United States Rubber Company was formed in New Jersey in 1892. It procured listing, as early as October 25, 1905, of $28,640,300 first preferred and $8,387,300 second preferred on the New York Stock Exchange, with authority to bring the totals up to $32,576,900 first preferred and $10,000,000 second preferred. There are now outstanding some $59,624,600 of the 8 per cent. non-cumulative first preferred, $538,400 6 per cent. non-cumulative second preferred and $36,000,000 common, and also $17,000,000 collateral trust mortgage bonds, $9,000,000 General Rubber Company debentures and $3,000,000 three-year 5 per cent. debentures of Morgan & Wright, a Michigan corporation, all of whose stock is owned by U. S. Rubber Co. or its subsidiaries. Morgan & Wright has been in business in Detroit for over thirty years, and has $3,000,000 preferred and $2,500,000 common stock. U. S. Rubber stocks have quoted during 1915, first preferred 101⅜ to 110, second preferred (February only) 76½ and common 51⅞ to 74¾.

The United States Tire Company, a subsidiary of U. S. Rubber, embraces not only Morgan & Wright, but the G. & J. Company, Hartford Rubber Works and the old Continental, all prominent makers of standard tires.

AJAX

The Ajax Standard Rubber Company was organized in December, 1905, and has gone solidly forward. Before the European war the stock paid dividends at the rate of 24 per cent. and sold as high as $400 per share. At an early date amalgamation with the Grieb Rubber Company changed the name to the Ajax-Grieb Rubber Company. Its plant is said to have worked twenty-four hours every working day since 1911. The Ajax Rubber Company, Inc., has recently been incorporated and has acquired the properties of the Ajax-Grieb Rubber Company and has called the preferred stock of the latter company for retirement. The new corporation will commence business with current assets approximately 900 per cent. in excess of current liabilities and

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with nothing on the liabilities side of the balance sheet excepting $3,000,000 of stock and $190,000 of current liabilities. Included in the directorate of the new company are Horace De Lisser and William G. Grieb, long identified with the company, and Hugh K. Pritchett representing the banking interests which have concerned themselves with the recent reincorporation.

GOODYEAR

The Goodyear Tire & Rubber Company dates from 1898 and has an Ohio charter. It owns a Canadian corporation and has acquired other rubber companies, including Durham, Motz and Killingly. Its gross sales are around $33,000,000 per year.

Eight million common stock and $7,000,000 preferred stock are outstanding. Twelve per cent dividends are paid on the common and 7 per cent. on the preferred stocks.

In April, 1916, Messrs. Kissel, Kinnicutt & Company sold $10,378,000 (out of a total of $17,500,000) of 7 per cent. cumulative preferred stock, issued under an amendment of the articles of incorporation whereby $25,000,000 of preferred stock and $25,000,000 of common stock were authorized. The purpose of this issue was to retire the old preferred stock (to be redeemed July 1, 1916) and to provide for new construction and further working capital necessitated by increase of business. The statement of net earnings accompanying this flotation strikingly illustrates the expansion in tire business:

Year ended	October	31,	1912,	$3,001,295
"	"	"	"	1913,	2,041,268
"	"	"	"	1914,	3,391,165
"	"	"	"	1915,	5,137,083
"	"	"	"	1916,	8,000,000

(six months estimated)

PENNSYLVANIA

The Pennsylvania Rubber Company is a Pennsylvania corporation of 1899. It now has outstanding $1,000,000 of preferred stock, $750,000 of common stock and no bonds.

MILLER

The Miller Rubber Company was formed in 1907 in Ohio and has been engaged in the line of manufacturing druggists' sundries and

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surgical rubber goods, tires being a relatively recent development. Its business shows a steady growth, with sales aggregating around $3,000,000 gross per year. About $1,000,000 of common stock and $325,000 of preferred stock are outstanding. The preferred pays 7 per cent. and the common 10 per cent. or better.

REPUBLIC

The Republic Rubber Company was incorporated in Ohio in 1901 as a successor to the Mahoning Rubber Company and is engaged in producing belting, hose and mechanical rubber products as well as tires. Some $3,100,000 preferred stock and $2,576,000 common stock are outstanding. The preferred stock pays 7 per cent. and the common stock 8 per cent.

SWINEHART

The Swinehart Tire & Rubber Company is strictly a tire manufacturing concern, and dates from 1904. Its plant is at Akron, Ohio. Eight hundred thousand of stock has been issued, on which 6 per cent. dividends are paid, and no bonds are outstanding.

BATAVIA

The Batavia Rubber Company is a New York concern incorporated in April, 1908. Some $223,000 preferred stock and $171,000 common stock are outstanding. The preferred stock pays 6 per cent. and the common stock 7 per cent. or better. A small bond issue ($30,000) is outstanding.

FIRESTONE

The Firestone Tire & Rubber Company was formed in 1900 as a West Virginia corporation, and in March, 1910, became an Ohio corporation. It manufactures rims as well as tires. Dividends on its $3,000,000 of common stock are on a 10 per cent. basis or better, and the $1,000,000 of preferred stock pays 7 per cent. Its gross sales are in the neighborhood of $20,000,000 per year.

FISK

The Fisk Rubber Company has had both Massachusetts and Delaware incorporation, dating from prior to 1908. Its business has seen a vigorous growth. Some $8,000,000 of common stock and $3,000,000 of first preferred stock and $2,000,000 of second preferred stock are outstanding. Dividends are paid on the two issues of preferred stock.

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KELLY-SPRINGFIELD

The Kelly-Springfield Tire Company was originally organized in New Jersey in 1899 as the Consolidated Rubber Tire Company. Its present title was adopted in January, 1914. Its outstanding stock approximates $3,750,000 first preferred, $907,000 second preferred and $4,000,000 of common. All three classes of stock are now receiving dividends, the rate on the common having been 6 per cent. at last accounts. The first preferred has recently quoted at 95 to 98 and the common at 290 to 296. Doubtless, by reason of this latter feature, the stockholders on November 30th voted to change the par value of the shares of common stock from $100 to $25, giving the preferred stock four votes per share in order to equalize the voting situation.

LEE

The Lee Tire & Rubber Company was organized in Pennsylvania as successor to the J. Ellwood Lee Company and makes both tires and druggists' rubber sundries. The business was originally established in 1883. The company has recently invoked the assistance of Messrs. Hornblower & Weeks and White, Weld & Co., which firms have arranged for reincorporation in New York, with a capital stock of 150,000 shares without par value. The new company has been incorporated and has issued 100,000 of the above shares at $50 per share. The prospectus estimated net profits for 1915 as $592,000.

The foregoing is a most cursory review of a topic that would run to many pages if fully treated. It would be of great interest to follow the separate development of the foregoing and many other rubber companies, and to discover the effect that the demand for rubber tires has had upon the general rubber business formerly conducted by them. The tire business is on an even sounder mercantile footing than the motor car industry, because automobiles must be shod and the number of tires called for by the public depends upon the number of cars in use rather than upon the number of new cars sold per year. Thus a minimum demand will always exist, barring only the circumstance of the discovery of some practicable substitute for rubber. The huge proportions of the rubber tire business are somewhat indicated in the foregoing narrative. Most of the rubber companies are in flourishing condition and the shares of such as are dealt in are in good favor.

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CHAPTER IX

THE ROMANCE OF SPEED

SPEED is one of the most important factors in the development of humanity. It is becoming more and more important with each progressive step in the life of the world. Primitive man enjoyed only the most meager facilities for transportation and communication and consequently developed only enough speed to measure up to his requirements.

So long as his needs could be satisfied with such transportation as his legs afforded and his back could carry, his progress toward the light of civilization was slow. When he made rafts that would carry him and his belongings down stream for short distances, and later when he fashioned rude boats and found he was able to push back against the current, he moved up astonishingly in the social scale.

Step by step the modern steamship and railroad have been evolved from the rudiments of transportation used by ancient humanity and with each improvement introduced, the pages of general history chronicle a notable leap forward in the condition of man.

During the last half of the Nineteenth Century practically the only development looking toward the betterment of transportation was in the matter of speed. The main difference between the railroads of the present, the steamships of the present and those of the period before 1850 is in the greater speed of the modern transportation.

Of course, speed without safety and certainty would be destructive and when speed is referred to in this work its means constructive speed. This, naturally embraces the idea of safety.

When His Majesty, the late King Edward VII, then Prince of Wales, visited the United States as a youth he was given a ride on the Chicago & Alton Railroad during which a speed of 60 miles an hour was touched for a brief time. The world gasped with horror and astonishment.

Today there are regular trains on the New York Central Lines, Pennsylvania Railroad and several other systems where an average speed of more than 60 miles an hour is regularly scheduled for hun-

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dreds of miles, excluding stops, and on the first named system there is at least one schedule of 250 miles that is covered every day at greater speed, stops included, and nobody wonders at it.

Speed in transportation by railroad and steamship has been highly developed. In fact, the most eminent railroad men hold the opinion that it is extremely unlikely that railroad trains will ever reach the point where 100 miles an hour can be scheduled or even where it can be made as a common rate of progress.

According to the leading commercial economists, freight transportation at an average of 50 miles an hour would save $2,000,000,000 annually to the people of the United States by bringing producer and consumer into more direct contact, thus reducing ultimate prices, broadening the market and increasing the tonnage and consequently the revenue of the railroads.

In that view of the subject the importance of speed is made very emphatic, but, taking the negative point of view, the simple fact is presented in a much stronger light.

If the rate of freight transportation could be made only half the present speed, no man can even guess what would follow. That the effect would be more profound than a world war is certain; that it would wreck the financial, agricultural and social systems of the world is equally certain.

Once having adjusted his life to a certain degree of speed, mankind could no more accept a lesser degree than he could get along without the mails. His mind is ready to make adjustments on a basis of greater speed but it is inconceivable for him to even consider a reduction.

When the present century dawned, perfection in speed, relative of course, was in sight so far as rail and boat transportation were concerned.

On the other hand, there had been no improvement whatever in road transportation since the development of the wheeled vehicle. A speed of 4 miles an hour and a radius of action not to exceed 20 miles a day were the established limits for moving freight on the roads, just as they had been in Caesar's time.

According to a recent report of the Department of Agriculture, the average ton mile cost of transporting freight by wagons was 23 cents. Naturally, there could not be very many ton miles charged up against a load if the producer of the freight expected to gain any profit

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VANDERBILT CHALLENGE CUP

Premier Road Race Prize of the Automobile World, and its Donor, William K. Vanderbilt, Jr.

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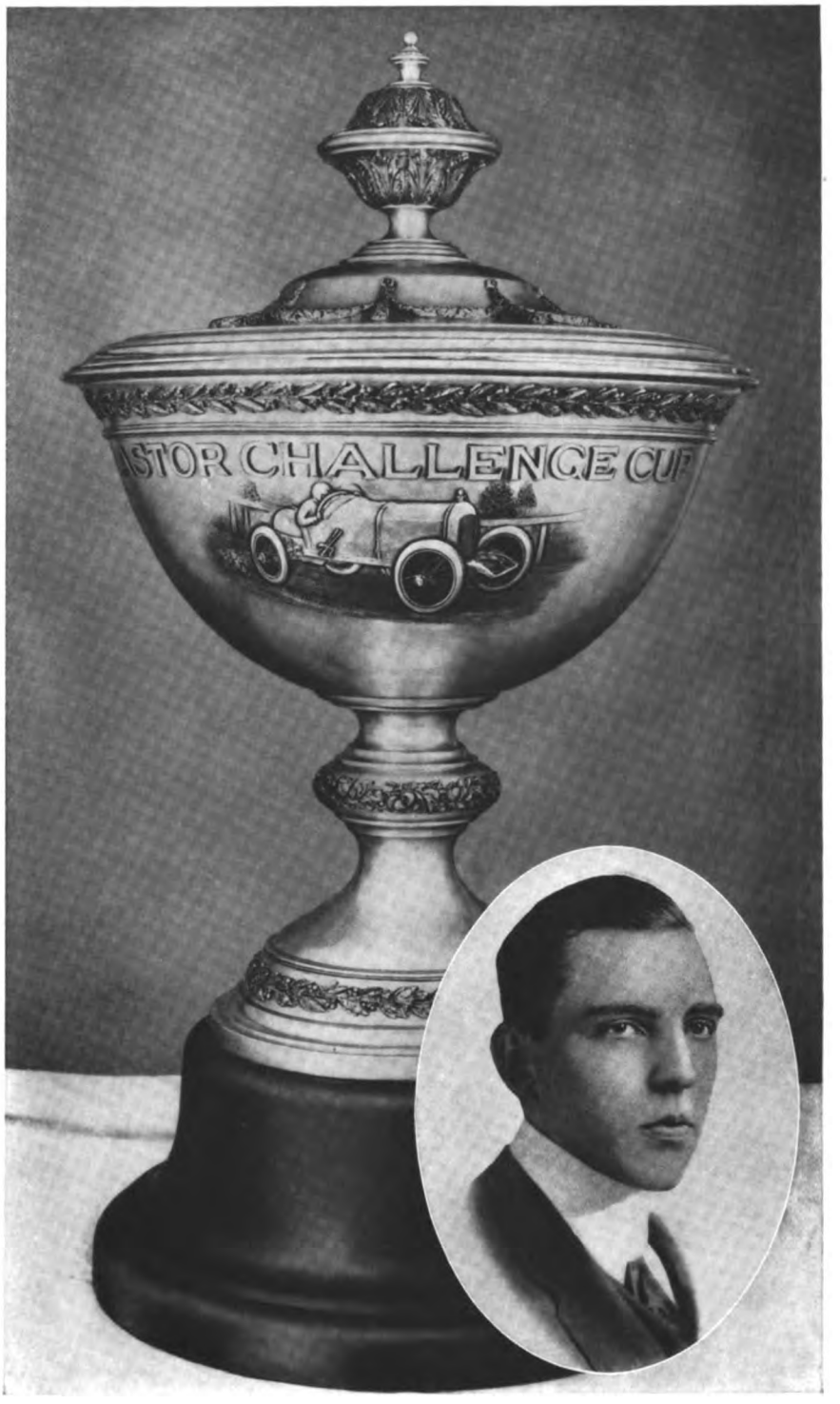

ASTOR CHALLENGE CUP AND ITS DONOR, VINCENT ASTOR

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and a considerable item in the charge would be the time of the men and draught animals engaged in the work.

If the freight could be hauled twice as fast as had been the rule, the per mile cost would be considerably reduced. In a corollory sense, if the speed were increased the haul could be longer at approximately the same cost. This opens up a tremendous field for thought, because if it is sound, it means simply that vast regions not now available for production could be brought into bearing. The single element involved would be speed and speed alone.

The birth of the automobile has furnished this element of speed to road transportation. Its development will surely accomplish and bring about the most profound revolution that humanity has experienced.

If by its speed it can bring into cultivation wide belts of land on either side of the great railroads, by making their cultivation profitably possible, and there can be no theoretical doubt on the subject, the importance of the automobile as the highest and most efficient phase of transportation will be accepted exactly the same as the railroad and steamship were accepted.

Nothing more flagrantly false was ever said than that speed is inherently bad. Speed is the difference between doing and not doing. Speed is the measure of efficiency. Speed marks the line between misery and well-being—the difference between civilization of today and the benighted squalor of the Dark Ages.

When the automobile came into being there were no roads worthy the name and high speed, as it is known today, was automatically out of the question. The roads that exist today and those projected for the future are children of the motor car. The car could not go fast without good roads and so they were built.

Despite the idiotic attempts of corrupt, ignorant or indifferent law-makers, the subconscious demand for speed proved to be so deeply implanted in man's mind that the roads were constructed and higher speed provided for.

So much speed did for the betterment of roads, but in addition the stresses of high speed forced more sturdiness into the make-up of the automobile because no car could go fast and far unless it were strong and powerful. The strength built into the early automobiles that crossed the continent and the power that enabled them to climb hills are full brothers born of speed itself.

The prime quality of the well-balanced, handsome motor-car of

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modern times is speed. Other forms of road vehicles may carry one in comfort from place to place but the automobile will do it quicker without sacrificing any of the comfort.

In developing the automobile, contests, in which speed was the measure, have played an important part. Road races, designed primarily as sporting events, but which really had the effect of compelling advancement in design, material and construction of automobiles, were first; second came the reliability runs, hill-climbing contests, etc., and third the classic speedway events.

When the road races were instituted, the motor-car was a crude thing in its details. Fifteen miles an hour was about the best average attained in road races up to 1897, when a Panhard car made a little better than 23 miles per hour in the Paris-Dieppe race of 106 miles. In 1898, another Panhard averaged 27 miles per hour for 895 miles in the Paris-Amsterdam contest. The following year the celebrated Paris-Bordeaux race was run and again a Panhard was first, averaging nearly 30 miles per hour for 351 miles. The motors of the winning cars increased in size each year. They started with cars equipped with motors rated at 3½ horsepower, then 4, then 6 and in 1898 the winner had an 8-horsepower motor. In the Paris-Bordeaux race the winner had a 12-horsepower motor, but one of the defeated contestants, a Mors, was furnished with an engine rated at 15-horsepower.

Panhard also won the first Tour de France of 1440 miles, averaging nearly 32 miles per hour with a two-passenger car rated at 16-horsepower, the most powerful gasoline motor so far used on the roads.

In 1900 a 16-horsepower Panhard driven by Chev. Rene de Knyff won the Nice to Marseilles race of 125 miles, averaging 36.6 miles per hour, but the hill-climb and track racing records of 1900 were taken by a 12-horsepower Mors car driven by Levagh. This machine, which showed marked improvements in type and style over its competitors, beat four Panhards, rated at 16-horsepower; a Peugeot 18, a De Dietrich 22 and a half dozen others up the 10½-mile climb of La Turbie hill near Nice and on the following day, March 31, set the first formal mark for 1 mile on the flat, standing start, and a kilometer record with flying start. The standing start mile was made in 1:38.6 minutes, while the flying start kilometer was done in :48.5 seconds.

There can be no shadow of doubt that the intense interest displayed by European manufacturers in these early automobile contests had the effect of stimulating the production of faster and better cars. They

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Courtesy E. R. Hollander

RESULT OF PUTTING 80-HORSEPOWER MOTOR IN 40-HORSEPOWER CHASSIS

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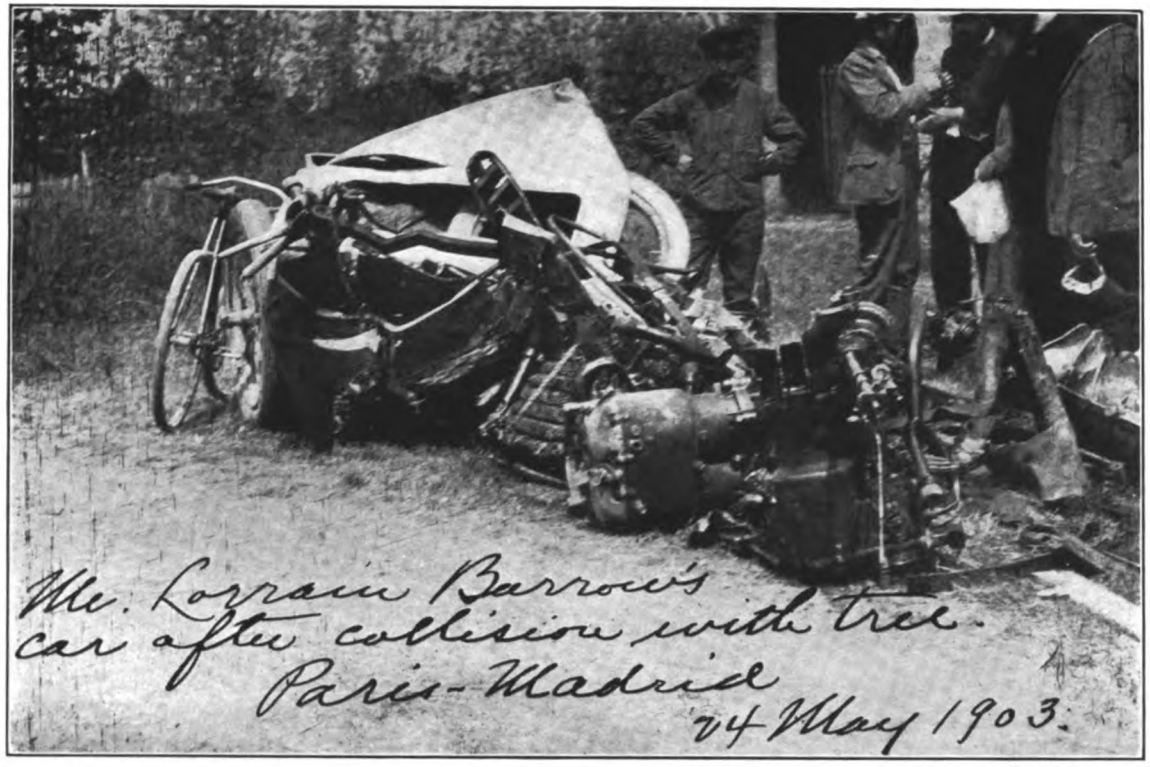

Courtesy E. R. Hollander

SMALL MECHANICAL DEFECTS OFTEN HAVE RESULTED IN COMPLETE WRECKS LIKE THIS

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DURYEA WINNING TIMES-HERALD ROAD RACE IN 1895

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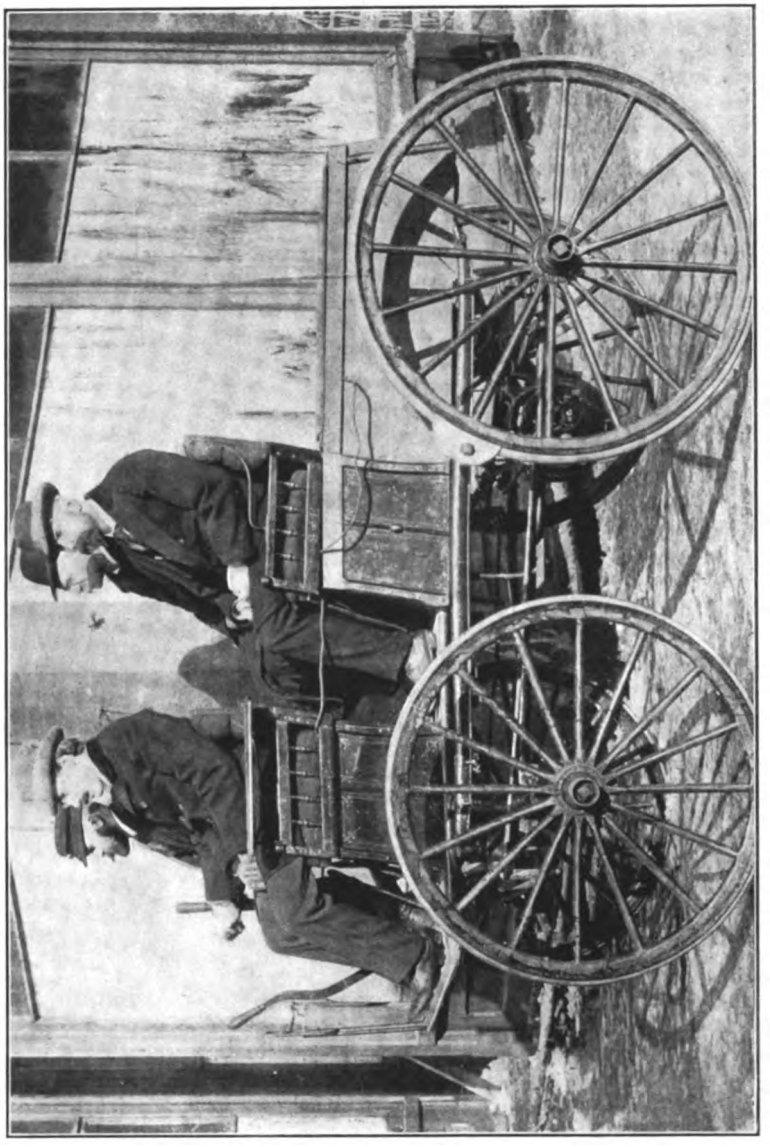

THE STURGES ELECTRIC IN TIMES-HERALD ROAD RACE, 1895

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learned from actual experience that a comparatively heavy road vehicle cannot be moved at high speed without high power. If the horse could make 4 miles an hour pulling a carriage that weighed with its passengers, say 1200 pounds, it would be unreasonable to suppose that a motor with only the theoretical power of 4 horses could pull a vehicle weighing twice as much at 4 times the speed of the horse.

That meant either bigger or more efficient motors and the result was a combination of the two ideas. The progressive steps from the 3½-horsepower motor to the 16-horsepower car were hastened and stimulated through the speed contests.

The early and sweeping success of Panhard was due to the fact that this type of automobile was built by the concern that was first in the field, plus an intelligent appreciation of that fact.

The races developed the weak spots in structure, function and design and the manufacturers took means to correct them. This attitude, possibly, was due to an effort to improve the automobile, but it is much more likely that the improvements were made in special cars designed for competition and that the benefits to the general run of cars were felt only after the soundness of the improvements had been demonstrated in actual racing.

In the United States, the Times-Herald road race from Chicago to Waukegan and return was originally scheduled to be held July 4, 1895. The newspaper offered a prize of $5,000 and from the flood of entries that were made it certainly appeared as if there would be a roaring race. But when the time approached, it was found that the entries represented a lot of dreamy ideas rather than actual vehicles and that the real cars capable of getting to the starting line were too few to make a race. Duryea was ready, the Benz car could have started, and Haynes had his car on the road nearly a year before. Henry Ford was too busy working at the Detroit illuminating plant to enter and the others were cars, either impractical for a road test or figments of the imaginations of their inventors.

There was nothing to do but postpone the event for a few weeks to give some of the others a chance to prepare for the race.

One postponement followed another until it was November 2 before any semblance of a contest could be staged. The race, not the real one by the way, was a walkover for the Benz, the only car to cover the course, after the Duryea had been ditched at an early stage by reason of the humane effort of its driver to prevent a collision with a farm

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wagon. On Thanksgiving day, the first American road race was held with five starters: two Benz machines, a Roger, a Duryea and an experimental electric called a Sturges. The Benz and Duryea were the only ones to get very far and the American car won through roads deeply covered with snow.

The following year a race was given between New York and Irvington. It was monopolized by Duryea, three of whose four entries took the money.

The repeal of the outrageous British highway law, which took effect November 14, 1896, was celebrated by a road race in England, between London and Brighton, 52 miles, which took on quite an international character but was of no real importance.

Alexander Winton made the first reliability run in the history of the American automobile when he drove from Cleveland to New York in the spring of 1897, but it was a slow hard trip. He also made the second, starting May 22, 1899, from Cleveland, driving himself, and carrying Charles B. Shanks, a newspaper person, at that time, as passenger. The car made the trip in 47½ hours running time, covering something over 700 miles and averaging 4:02 minutes to the mile on the road. Winton, his car and passenger were greeted with much interest wherever they went and it must be credited to the good work of Shanks that the public was kept fully informed of the feat. His articles attracted much attention and were the first real effort at intelligent publicity with which the new industry had been favored.

When Winton reached New York a million people saw his car and part of the credit for that crowd must be given to Shanks. However, it was the enterprise of Winton that caused Shanks to make the trip and so finally the credit for the most successful reliability run held in America for several years, simmers back to the pioneer commercial manufacturer in the gasoline automobile field, Alexander Winton.

Haynes and Olds and other manufacturers, then engaged in producing automobiles, profited by Winton's Cleveland-New York run for they soon found that the speed and reliability demonstrated by Winton's car and the news of it, spread by Shanks, had centered a large amount of interest in their own product.

One of the other American manufacturers wrote to Winton sometime after the New York trip and said that the trip had proved the turning point in the business and that at the time of the communica-

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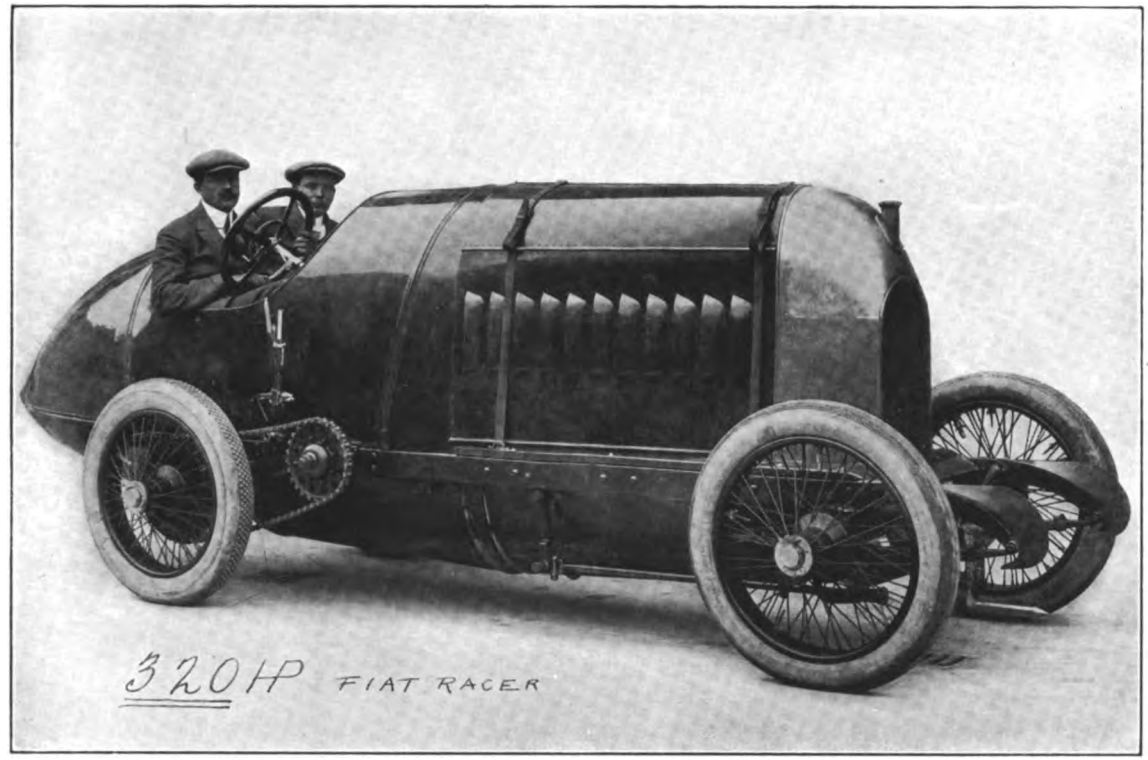

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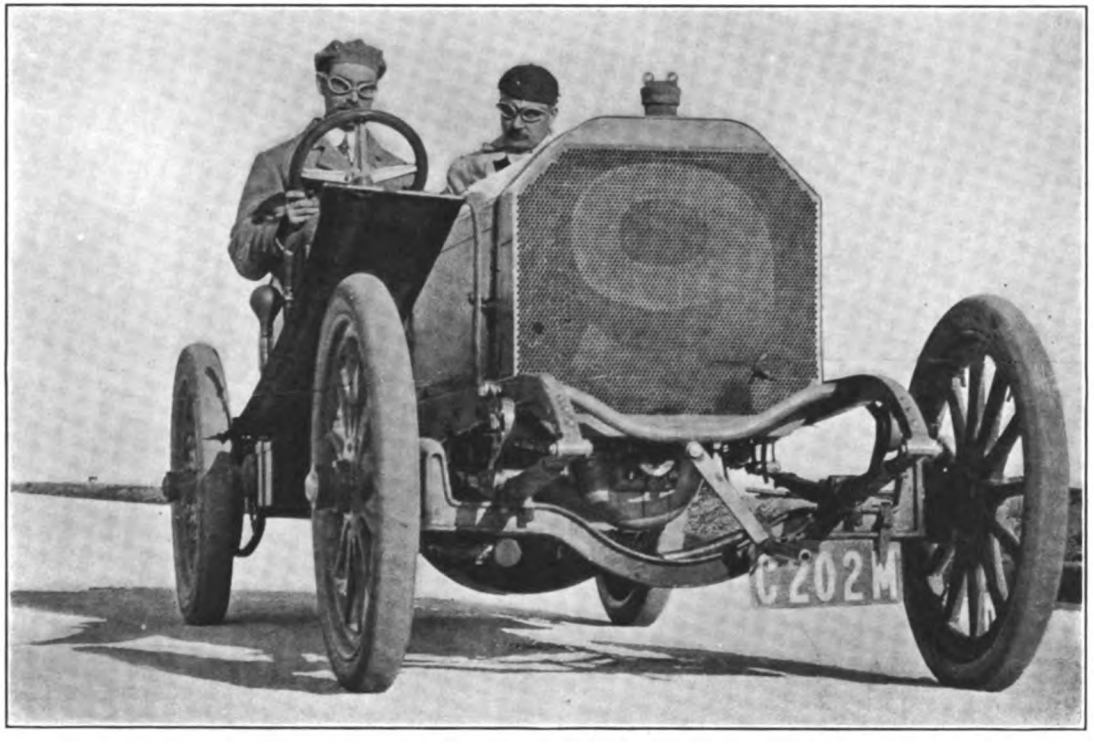

JOSEPH TRACY, S. A. E., AT WHEEL OF 1905 VANDERBILT CUP LOCOMOBILE

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tion, the factory of the writer had on hand orders enough to keep it busy for six months.

Prior to the trip, even the records of Winton's company show that the sales were made almost exclusively to engineers who desired to buy and experiment with an automobile that would really run, but after the trip, the sales were made to the public at large. Thus an event that should be classed in its day as a speed contest, or sporting contest, was actually a stimulator of business.

April 14, 1900, was the date of the third road race in America, if the Duryea-Benz affair at Chicago and the Duryea excursion to Irvington can be designated as races. It was staged on the country roads between Springfield and Babylon, L. I., over a course that measured about 50 miles. It was not much of a race at that but it had nine actual participants. A. L. Riker won the cup in an electric, consisting mostly of batteries and which made nearly 25 miles per hour, finishing in 2:03.30.

A Locomobile steamer driven by the late S. T. Davis Jr. was second and a gasoline motorette driven by A. Fischer was third. Gasoline cars driven by D. Wolfe Bishop, Albert C. Bostwick and G. F. Chamberlin finished in order and three other starters failed to complete the course.

April 26, 1901, the Long Island Automobile Club held an endurance run of 100 miles, starting and finishing at Jamaica, which was made in full by 37 cars. The rules were so slack, however, that the lessons learned from the run were not important. Twenty-one of the contesting cars were certified perfect.

The Automobile Club of America promoted the first big automobile touring contest ever run in this country in September, 1901. The course was laid out from New York to Buffalo, at which city the Pan-American Exposition was then being held. It attracted an entry list of about 80 and was run under rules that were not designed to go a great way in the enlightenment of the automobile art. The cars were a heterogenous lot and the part of the run that was completed was under distressing weather conditions. The tour got as far as Rochester when word was received that President McKinley had been assassinated and the event was abandoned.

Such tours as those of the Long Island Automobile Club and the first given by the Automobile Club of America, while interesting, as showing that the car had developed so that it would go under favorable

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and unfavorable conditions, proved nothing in particular except in a negative way.

In the meantime there was a veritable craze for automobile racing abroad. James Gordon Bennett presented a cup in 1900 for an international road race. In June, 1900, the first race was run from Paris to Lyons, 351½ miles. The race proved that the automobile of that day could not stand up under the big motors installed in them for racing and all the representatives of all the teams fell out and gave up the contest. These included Alexander Winton, who buckled a wheel of his car about midway of the course. The race was won by a Panhard, driven by Charron, which bent an axle near Orleans and withdrew, only to have the word brought that all the other competitors were out of it. Charron, thereupon returned to the course and limped to the finish, making the average speed of about 38 miles per hour.

The 1901 race was run from Versailles to Lyons and won by a Panhard, driven by Girardot, averaging 39½ miles per hour. The 1902 race was from Paris to Vienna and was won by a Napier, driven by S. F. Edge, which was the only car to finish. There was some improvement noted between 1900 and 1902 in the sturdiness of racing automobiles, but the detailed accounts of such races as the first three for the Bennett trophy are simply a record of mishaps and breakages due to high, sustained speed over poor roads.

In 1903 the race was held in Ireland and was 368 miles long. Two Wintons and a Peerless represented America in this contest but a Mercedes won, driven by Jenatzy, which averaged a little better than 55 miles an hour, actual running time between controls.

The 1904 running was in Germany and was over an 85-mile circuit near Homburg. A Richard-Brasier, driven by Thery, averaged about 51 miles an hour in winning the cup. In 1905 six countries took part over a hilly circuit in France and a larger and more powerful Richard-Brasier, also driven by Thery, won, but on account of the dangerous and winding course the time was slow.

The Bennett cup races performed a big service for the automobile in that they proved it to be poor practice to install a 100-horsepower motor in a 40-horsepower chassis. They showed that there should be a nice balance and symmetry in the whole automobile.

The 1906 race in France was over the Sarthe circuit, 766 miles, designated as the Grand Prix de France and run under the auspices of the Automobile Club of France. This race was conducted over good

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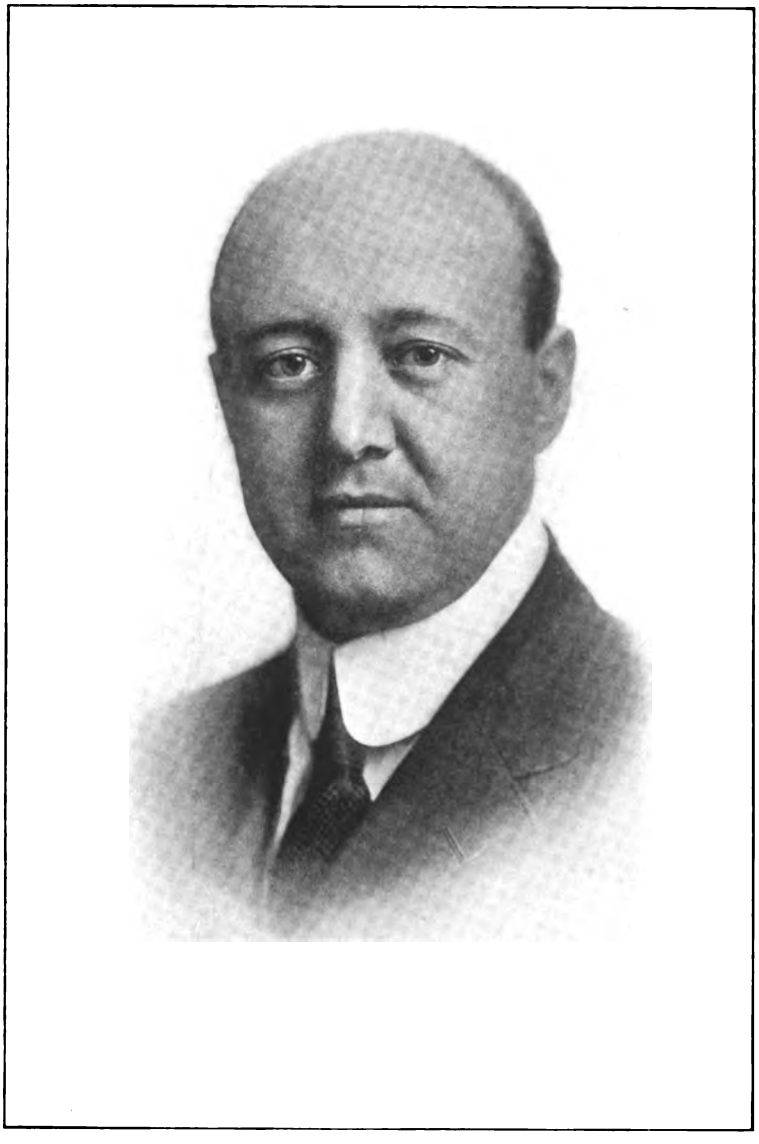

F. E. MOSCOVICS

Scientist, Investigator, Engineer. Pioneer developer of high speed.

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roads and a Renault, driven by Szisz, won with an average speed of 62.28 miles per hour, for the two days consumed in racing. In this race removable rims were really used for the first time in a major automobile contest and it was specially noted at the time that the improvement affected a saving of about 15 minutes in making tire changes. Previously, it had required from 15 to 20 minutes to change a tire, but with the use of improved rims, the average time for a change was reduced to 4 *minutes*. In comparison with the all but instantaneous changes made in recent races with demountable wire wheels, 4 minutes to change a tire seems a long time.

Speedway racing has served two purposes. First it affords a sporting spectacle that compares with that of a road race and second, it gives the motors a fierce test.

Road-racing, from the engineering point of view, gave a supreme test of innovations no matter where they were installed in the cars and led to a whole line of development, the fruits of which are to be found in the modern automobile. It tested motors, springs, transmission, ignition, lubrication, but principally symmetry and balance. If the gears and shafts of a racing car failed to harmonize with the motor, no matter how good a motor it might be, the racing test proved nothing, because a stripped gear or a broken shaft or any other vital part effectively prevented the test of the motor by putting the car out of the running.

Reliability runs, where the highest degree of speed was not required all the time, were useful in testing stock product, or at most design that was intended for use in the next factory schedule of the company entering the contesting car. The reliability runs were for stock product, or approximately stock product.

Road-racing tested innovations throughout the car; reliability runs were in the nature of proof of the innovations in stock product, but speedway races, came into vogue after the car had been developed so that it was of high speed, sturdy reliability and possessed of degree of symmetry. The speedway races are useful, aside from any element of the spectacle, to test the motor of the automobile.

The first speedway to be built in the United States was the Indianapolis course, the moving spirits of which were A. C. Newby and Carl G. Fischer, over which annually a 500-mile contest is staged. The Indianapolis course is built of brick and was constructed for a theoretical speed of 61 miles per hour. The theoretical speed limit is that

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point where the car begins to skid. On the brick turns at Indianapolis, the slewing and slipping of the driving wheels begin after a speed of 61 miles an hour has been attained. That, however, is not the practical and actual limit of speed that can be attained on the track. The 2½-mile oval is capable of accommodating a much higher rate as has been shown in the races since 1911 and in numerous public and private trials.

The limit of speed at the Indianapolis Speedway apparently is in the neighborhood of 100 miles per hour but it requires a specially skilful driver to attain that rate of speed with safety.

The Los Angeles mile board saucer, designed and built by F. E. Moscovics and his associates, was second.

The speedway at Atlanta has fallen into disuse, chiefly because of the dearth of automobile factories in the South, but there were some excellent races run over the track since 1910. It was not so fast as Indianapolis in its best day.

The wooden speedway at Chicago, a two-mile oval, built in 1915, set a new mark in speed possibilities as was demonstrated at the first race meeting held there. The track is built for a theoretical speed of 73 miles an hour with straight banking and a good car in the 300-cubic inch piston displacement class can take the whole circuit wide open.

The practical speed attainable on the Chicago track is probably not far from 125 miles per hour when the racing cars would be out pretty close to the top of the banks. Such a rate of speed is not a practical possibility with the motors under 300-cubic inches of the 1915 types.

In the 1915 race meeting at Chicago the 500-mile sweepstakes was won at an average speed of 97.65 miles per hour and the 100-mile match race was done at the rate of 101.25 miles an hour.

The Sheepshead Bay speedway, New York, was completed in the fall of 1915 and two races were run over it. On October 9, a 350-mile race was run, in which the winning car averaged about one mile per hour better than the winner of the 100-mile race did at Chicago, and November 2, a 100-mile invitation race developed a speed of 105.39 miles per hour.

Among the moving spirits of the Sheepshead Bay project, which cost about $3,000,000, were A. C. Newby, Anderson T. Herd, Carl G. Fischer, H. M. Swetland, James C. Nichols, Fred J. Wagner and others.

The New York track is a bowl-shaped oval, patterned in general

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lines after the cement track at Brooklands, England, but one mile less in circumference. The engineers who built Sheepshead Bay track made it somewhat different from the Chicago speedway. Instead of straight banks, the curves at Sheepshead are built on the lines of a parabola.

This has the effect of shortening the straightaways but by gradually introducing the turns, allows of slightly more speed than would be possible to carry with straight banking.

The same size cars that made 89 miles per hour at Indianapolis and 97 miles per hour for 500 miles at Chicago made 102 miles per hour for 350 miles in New York. The difference between the speed possibilities of the courses is probably in about that proportion.

The New York track was built for a theoretical speed of 96 miles per hour and it is within the possibilities that a 450-inch car, or one of larger size, will turn the oval at a speed of 140 miles per hour.

The Chicago track is faster than the 1915 car of 300-cubic inches and it is likely that New York can accommodate more speed than any existing automobile can make, save on a straightaway.

When it was demonstrated to the automobile engineers that the small cars could make the whole circuit of either Chicago or New York speedways with throttles wide and without the necessity of shutting down on the turns, as must be done at other tracks, in this country at least, many of them predicted that the racing cars would experience much trouble in getting enough oil to the cylinders. On such tracks as Indianapolis, for instance, where the drivers habitually shut down on the turns, no such trouble happened, because the act of shutting down gave the required opportunity for the cylinders to get lubrication. The engineers feared that a whole race without shutting down might affect the supply of lubricant to the motor. The actual tests showed that their fears were not entirely ungrounded and the terrific and long continued speed searched the cars for weak spots and found them largely in the connecting rods.

Car after car succumbed in the speed events where the motors turned over from 2700 to above 3400 times per minute, and the light but tremendously strong connecting rod was the place the trouble centered.

These breakages probably resulted from defective lubrication coupled with excessively high speed continued over a long period of time.

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Undoubtedly the engineers will correct the fault and then cars of the same size will probably set new high marks. It always has been noted in speedway races that the rushing, speeding entries are the ones that encounter more mechanical troubles than the very fast, but more steadily driven cars. For instance: If a car with a maximum speed of say 110 miles per hour is consistently driven at 105 miles an hour, holding in reserve the last ounce of its speed, it is more likely to finish a long contest than another car with the same maximum possibilities that is driven clear to the limit.

The fundamental engineering rule about the rate of increased deterioration being in the square of the velocity will probably have to be amended to take in some higher proportion, for the difference between the deterioration that takes place at 100 miles per hour and at 110 miles per hour appears to be considerably more than would be covered by merely squaring the comparatively small increase in rate of travel.

In a match race held November 2, 1915, a twelve-cylinder Sunbeam, driven by De Palma, covered three laps at the rate of 113.86 miles per hour. The motor of the car measured 549 cubic inches.

The mark established in the 350-mile race, set a new record for the distance, 102.56 miles per hour, and the 100-mile race was also deserving of a place in the record book, as a Peugeot car covered the distance at the rate of 105.39 miles per hour. The actual record was made at Brooklands in 1912 by a car of much larger size.

Automobile racing, since the early days when amateurs took part in it for the pure sport of driving or owning a fast car, has been the finest example of a commercialized sport ever displayed. It has served several valuable purposes in testing and improving design, harmony and balance, but when that is said, the whole story has been told so far as it affects engineering.

The commercial idea has two phases: First, the advertising value of the contests to manufacturers and distributers of automobiles and second, in the profit to be derived from the public's wish to be entertained.

The road races were valuable advertising for contestants and the companies represented. It was worth a big sum to the manufacturer fortunate enough to win one of the early cup classics, providing the company had cars to sell after the race was run. But it was a pretty

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A. C. NEWBY
"Father of the Speedways." Head of National Motor Vehicle Company.

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FINISH GRAND PRIZE AUTOMOBILE CLUB OF AMERICA GOLD CUP AT SAVANNAH, 1908, FIAT (WAGNER) WINNING

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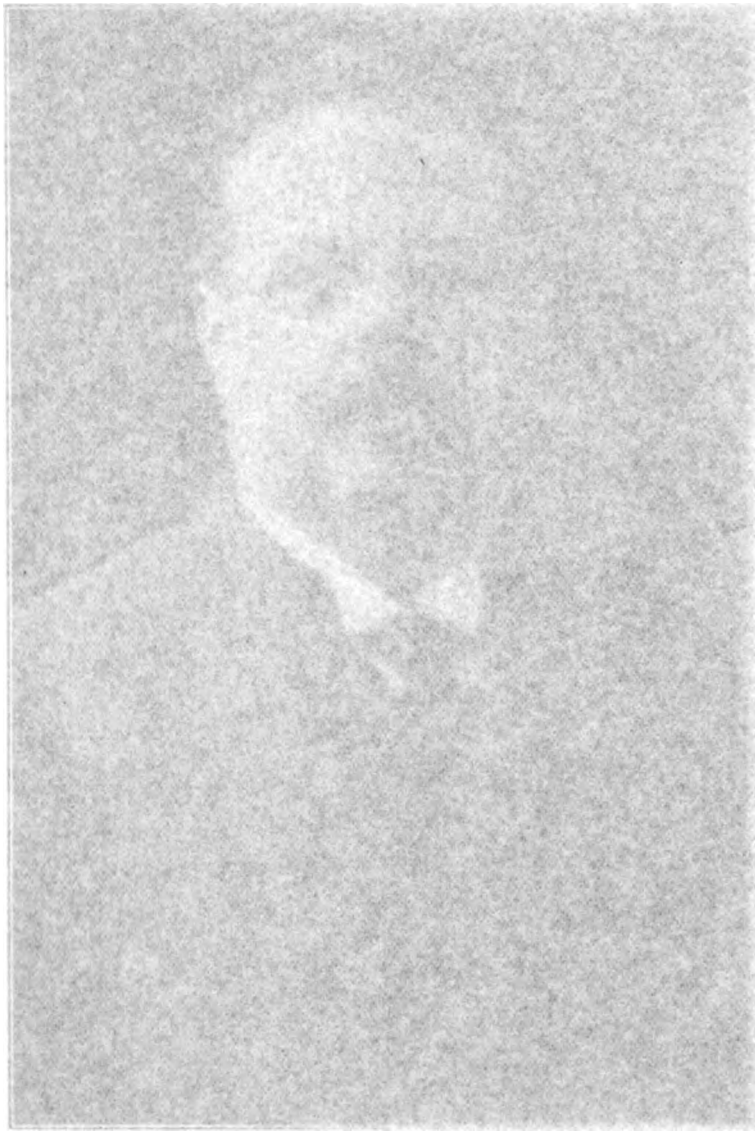

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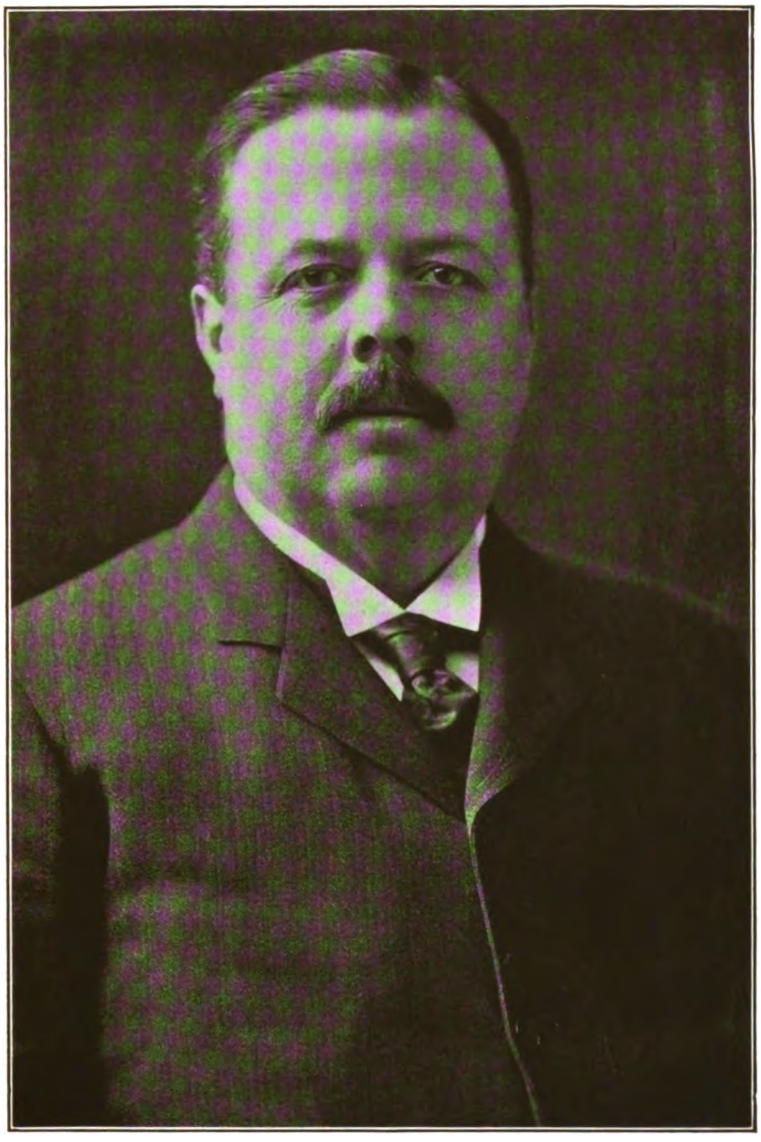

CHARLES J. GLIDDEN
Donor of Glidden Trophy.

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ELMER RAND HOLLANDER

Sportsman and Developer of Speed. Member Manufacturers' Contest Association.

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poor example of an advertising manager who could not get some glory and profit for his company out of the mere fact of competing.

The reliability runs of any importance whatsoever were only those of the "knock down and drag out" order staged under stringent rules. The others were pleasure jaunts run under the guise of contests. The tours conducted by the American Automobile Association and the one under the auspices of Frank A. Munsey were, in the main, profitable to the development of the American automobile. Some of the Chicago, Hartford and Buffalo runs were moderately profitable, but the others were of little real value to engineering.

Charles J. Glidden's name is linked with touring-reliability contests on account of his presentation of the Glidden trophy, the winning of which was sharply contested for several years. Glidden donated the cup when the automobile was crude, coy, uncertain and hard to please and the stringent rules that obtained later were not only unknown at the time, but would have been impossible if they had been known.

The first tour of the American Automobile Association was to the St. Louis Exposition in 1904 and was strictly a go-as-you-please affair in which each individual did whatever he liked. In 1905, the first of the Glidden contests, the time schedule was the main factor in scoring the cars. The course was from New York through New England and the White Mountains and back and the cup was awarded to a Pierce-Arrow car, driven by Percy P. Pierce. The 1906 tour was from Buffalo to Quebec and thence to the White Mountains and time in covering the schedules was the main factor in scoring, although the rules provided for more details than those of the previous year.

Between 1907 and 1910 a technical set of rules had been devised to insure the stock status of entries and a system of penalization was framed to cover work done in repairing or adjusting anything about the car except tires.

The culmination of the Glidden tours was the event of 1910, which was a terribly trying affair for everybody concerned. It was staged from Cincinnati through the south, turning north in Texas and finishing at Chicago. There were few roads in the south at that time and what there were, were poor. The daily schedules were long and the rules technical to a high degree. It was provided, among other things, that an entered car should not only correspond in every detail with the entry blank specifications, but that the entered car must be part of an output of certain size. Several Buicks were ruled out before the start,

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because they were of a model that was different from the regular Buick types. A Premier car, which answered in detail to the specifications of the entry blank, was allowed to start, although an auxiliary oiler, mentioned in the entry was not a part of the stock equipment of a sufficient number of Premier cars to bring the particular car entered within the class of Premier stock models.

A. H. Whiting, a distinguished engineer and one of the founders of the S. A. E., was referee of the tour, and David Beecroft was prominently identified with the technical department of the contest. It was a very fine technical point, but in the light of the action on Buick, which by the way never took the form of a direct ruling, the fact that the Premier car was allowed to start, has always puzzled a good part of the industry. At any rate, the Premier entry scored the least number of penalties and in the original ruling made by the referee, it was awarded first place.

But after the finish, when the cars had been officially placed, a protest was filed against Premier, alleging the technical rule about stock status. Whiting entertained the protest and on appeal the matter was laid before the Contest Board of A. A. A., of which the late Samuel M. Butler was chairman and the referee was sustained in disqualifying Premier. The whole matter was then transferred to the courts and the ruling of the Contest Board was upheld on broad lines following legal precedent, that sport-governing bodies must be supreme in matters under their jurisdiction but without going into the merits of the particular case in much detail, save enough to show that the Premier car had been duly entered and that the jurisdiction of the board had been acknowledged by the contestant.

The Munsey tour from Philadelphia through New England and the White Mountains and to Washington, was the last great technical tour to be held in this country. It was run in September, 1910, and was a great success in proving the reliability and sturdiness of numerous types of automobiles under sharply technical conditions. The referee on this occasion was Ernest L. Ferguson.

The contests staged by the Chicago Automobile Club, Chicago Motor Club, Buffalo Automobile Club and the Automobile Club of Hartford were all interesting technical tours, but not of the national importance of the Glidden series and the single Munsey contest.

The Glidden tour of 1911 was a time-schedule contest from New York to Jacksonville, Florida, and the affair of 1913 was a similar run

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from St. Paul through Minnesota, North Dakota and Montana. Since then the annual tours of the A. A. A., when held, have been similar to the 1904 affair, go-as-you-please.

While the period of road racing and reliability runs was in flower, it was quite the common practice to hold competitions in hill-climbing, which, as a whole were interesting and valuable in the proving of one of the great qualities of the automobile—its ability to take a heavy grade at high speed. These contests became quite as technical as the reliability runs about 1910 and died out completely with the decline of the rules designed to establish stock status. The most ridiculous exhibition ever made in the department of hill-climbing was the one staged near Chicago where the winners were determined by a formula, which was supposed to take into consideration all the elements of performance.

It may be said in passing that the lead-pencil proved mightier than the automobile motor in some of these events.

The purpose and service of the road-race, hill-climb and the reliability run have been accomplished and have been well-done, considering everything. As practical factors in the development of the automobile they have done all they can and belong to the record. If more of them are promoted and given they will be as sporting events, pure and simple, and the automobile industry must look to the speedways for the valuable lessons of the future, in contest matters.

The name of Vanderbilt is bracketed with automobile speed, because William Kissam Vanderbilt Jr. donated the Vanderbilt Challenge Cup to be contested for by the fastest automobiles in the world, and the races run for this trophy proved more and did more for the development of the American automobile than any other prize ever offered for racing.

The main idea embodied in the cup was that of spectacular sport. An automobile race comes within that classification, but there is an underlying significance about the cup that goes deeper than mere sport. To win it requires speed and stability in the car as well as skill and good fortune in the driving.

No man would enter a car and start unless he had an idea the car could finish. That argued for stable construction and high speed in an increasing number of types of cars. Those elements carefully developed in a number of cars finally pervaded the whole structure of

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manufacturing and the result was increased speed and stability in all cars.

When Vanderbilt presented the cup high speed, as it is known today, was impossible. Through the encouragement given by the cup something has been added to the speed of the average car of the present. Just how much this addition of speed amounts to is impossible to state, but that it amounts to something is beyond all question.

The Vanderbilt cup served to stimulate the building of faster and better automobiles through the vast amount of publicity that resulted to the winner of the cup in the daily and periodical press. To win the cup meant, literally, free advertising worth hundreds of thousands of dollars. If the manufacturer expended a few thousands to improve the speed and power of his entry and then won publicity a hundred fold through success in the race, it was good business from the manufacturer's point of view and the betterment of the automobile was a distinct element of advantage to the public.

Mr. Vanderbilt, always a liberal supporter of motoring, was called upon to take the lead in handling the early races and his uniform willingness to step in and shoulder the burdens, financial and otherwise was in refreshing contrast to that of other persons whose foresight was not so clear as his.

Eminent as Mr. Vanderbilt may be as a railroad official, prominent as he may be as a financier, publicist and humanitarian, it is extremely likely that when he is assigned his place in history, it will not be as any of these, but going deep into the fundamental elements of human service, his niche in the Hall of Fame will be as the pioneer developer of automobile speed.

The service of such men as Vanderbilt, Bennett and Glidden has been of the utmost importance, but there have been numerous others, Paul H. Deming, Albert R. Shattuck, Frank B. Hower, Planchet, Brazier and numerous individuals who have helped with their trophies and influence and the international automobile clubs of all the countries where the automobile has grown, have presented valuable plate and held jurisdiction of contests. Referring specially to the service of the Automobile Club of America it may be said that the Grand Prize Gold Cup for premier honors in road racing over a long course with cars unlimited in size has been the object sought in some of the most terrific struggles ever staged.

In the field of speedway trophies, the donation of the Astor Cup,

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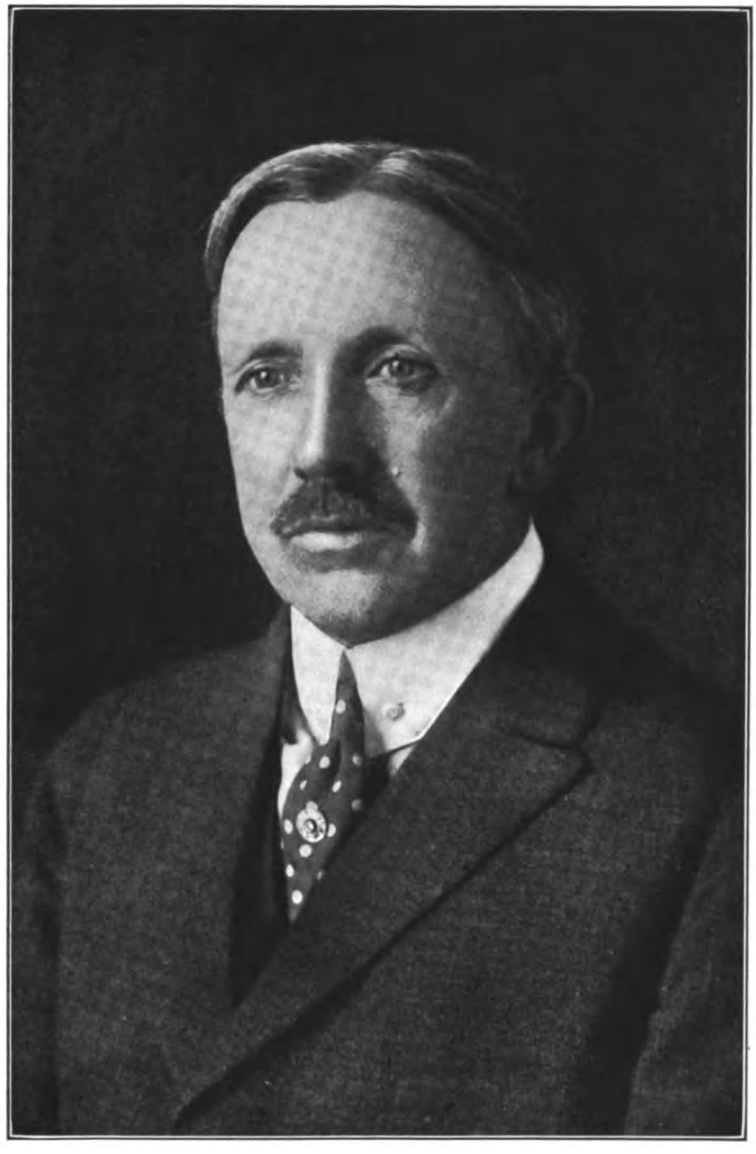

JAMES C. NICHOLS

Sportsman, Worker, Optimist. Prominent in foundation of Sheepshead Bay Speedway.

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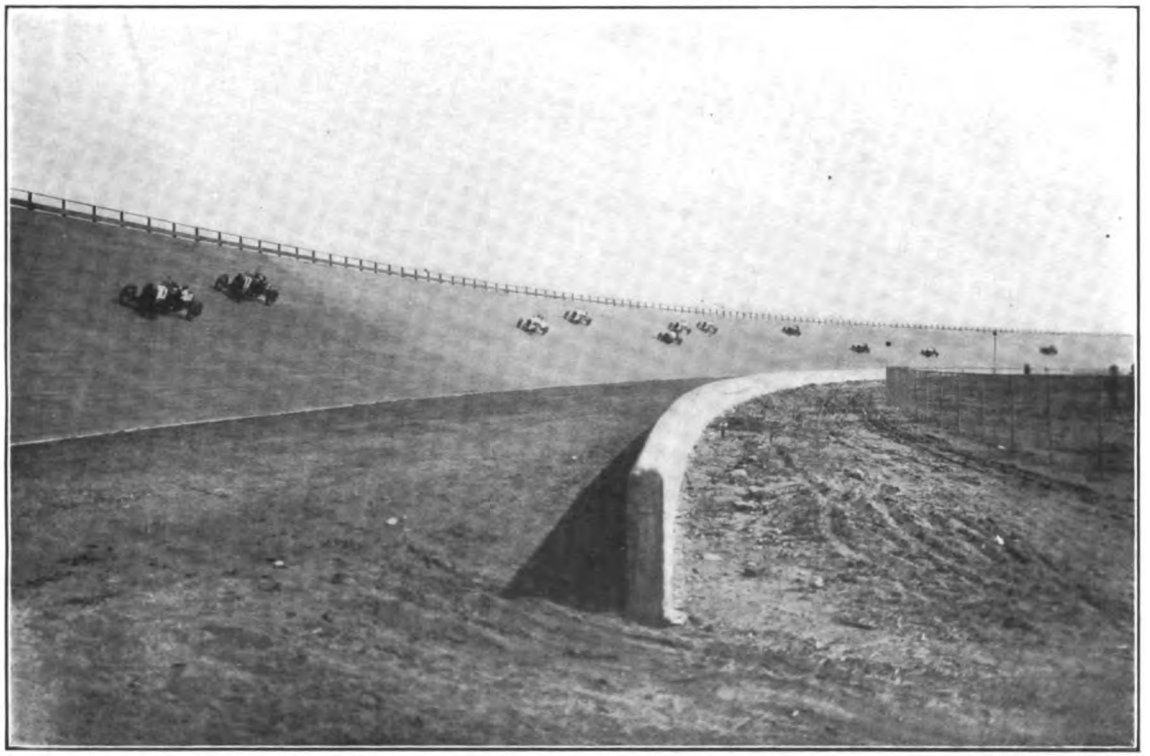

SHEEPSHEAD BAY SPEEDWAY DURING FIRST RUNNING OF ASTOR TROPHY RACE

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by William Vincent Astor, for competition at Sheepshead Bay is the chief. The Harkness Gold Cup is another important trophy, but it should be borne in mind that the real value of speedway races is in testing the motor of the automobile and that the idea of sporting competition is entirely lacking in the sense in which the public accepted the early road races. While it is possible that the Astor trophy might, conceivably, decorate the buffet of some wealthy contestant who drove and won with his own car, it is far more likely that its real use will be in advertising the fact that some certain type and make of automobile succeeded in winning it.

Occasionally, during the period from 1900 to 1915 the public has shown signs of satiety and the attendance at strictly commercial race meetings and competitions has declined to a distressing degree. At such junctures—and there have been several of them—interest has been revived to some extent by the entry into the field of racing of some well-known individual.

William Ziegler Jr. was a shining example, entering the field of racing at a moment when the automobile industry was on the point of abandoning it. Ziegler bought cars and raced them persistently for two years, attracting much attention and causing several others to follow his example. His successes were small and his bad luck large, but he served the racing idea well by stimulating it at a time it needed stimulation. W. S. Vielé conducted Mr. Ziegler's actual racing activities.

Harry S. Harkness is another and E. C. Patterson another and the list of real helpers of racing by actual participation includes many well-known names.

The official records of automobile speed for various distances established on beach, track, road and speedway up to the beginning of 1916 are as follows: (It should be noted that while most of the actual speed marks were improved in 1915, official formalities had not been observed to insure their being placed upon the record books. A complete list of the performances of 1915 that will be records when formal application has been made to make them so, follows the official list.)

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OFFICIAL RECORDS

Allowed and Accepted by A. A. A. Contest Board

STRAIGHTAWAY FREE-FOR-ALL RECORDS, REGARDLESS OF CLASS

Distance	Time	Driver	Car	Place	Date
1 kilo	15.88	Burman	Blitzen Benz	Daytona	Apr. 23, 1911
1 mile	25.40	Burman	Blitzen Benz	Daytona	Apr. 23, 1911
2 miles	51.28	Burman	Blitzen Benz	Daytona	Apr. 23, 1911
5 "	2:34	Hemery	Darracq	Daytona	Jan. 24, 1906
10 "	5:14.40	Bruce Brown	Benz	Daytona	Mar. 24, 1909
15 "	10:00	Lancia	Fiat	Daytona	Jan. 29, 1906
20 "	13:11.92	Burman	Buick Bug	Jacksonville	Mar. 30, 1911
50 "	35:52.31	Burman	Buick Bug	Jacksonville	Mar. 28, 1911
100 "	1:12:45.20	Bernin	Renault	Daytona	Mar. 6, 1908
150 "	1:55:18	Disbrow	Special	Jacksonville	Mar. 31, 1911
200 "	2:34:12	Disbrow	Special	Jacksonville	Mar. 31, 1911
250 "	3:14:55	Disbrow	Special	Jacksonville	Mar. 31, 1911
300 "	3:53:33.50	Disbrow	Special	Jacksonville	Mar. 31, 1911
81.65 "	One Hour	Disbrow	Special	Jacksonville	Mar. 28, 1911

(Standing Start)

1 mile	40.53	Oldfield	Benz	Daytona	Mar. 16, 1910

SPEEDWAY RECORDS, REGARDLESS OF CLASS

¼ mile	8.16	Burman	Blitzen-Benz	Indianapolis	May 29, 1911
½ "	16.80	Burman	Blitzen-Benz	Indianapolis	May 29, 1911
1 kilo	21.40	Burman	Blitzen-Benz	Indianapolis	May 29, 1911
1 mile	35.35	Burman	Blitzen-Benz	Indianapolis	May 29, 1911
2 miles	1:15.96	Bragg	Fiat	Los Angeles	Apr. 13, 1910
3 "	1:54.83	Bragg	Fiat	Los Angeles	May 5, 1912
4 "	2:33.37	Bragg	Fiat	Los Angeles	May 5, 1912
5 "	3:11.75	Bragg	Fiat	Los Angeles	May 5, 1912
10 "	6:35.62	Robertson	Simplex	Los Angeles	Apr. 9, 1910
15 "	10:25.17	Hearne	Benz	Indianapolis	July 4, 1910
20 "	13:58.14	Oldfield	Stutz	Indianapolis	May 30, 1914
25 "	17:30.40	Oldfield	Stutz	Indianapolis	May 30, 1914
50 "	33:45.32	Christiaens	Excelsior	Indianapolis	May 30, 1914
75 "	50:21.24	Christiaens	Excelsior	Indianapolis	May 30, 1914
100 "	1:10:46.50	Duray	Peugeot	Indianapolis	May 30, 1914
150 "	1:46:20	Duray	Peugeot	Indianapolis	May 30, 1914
200 "	2:25:11	Duray	Peugeot	Indianapolis	May 30, 1914
250 "	3:00:58.48	Thomas	Delage	Indianapolis	May 30, 1914
300 "	3:38:29.59	Thomas	Delage	Indianapolis	May 30, 1914
350 "	4:15:22.69	Boillot	Peugeot	Indianapolis	May 30, 1914
400 "	4:52:02.10	Thomas	Delage	Indianapolis	May 30, 1914
450 "	5:27:33.50	Thomas	Delage	Indianapolis	May 30, 1914
500 "	6:03:45.94	Thomas	Delage	Indianapolis	May 30, 1914

(Hour Records)

74 miles	1:00:00	Harroun	Marmon	Los Angeles	Apr. 16, 1910
148 "	2:00:00	Harroun	Marmon	Los Angeles	Apr. 16, 1910

ONE MILE CIRCULAR DIRT TRACK RECORDS

1 mile	46.20	Disbrow	Simplex	St. Louis, Mo.	Aug. 8, 1914
2 miles	1:32.60	Disbrow	Simplex	St. Louis, Mo.	Aug. 8, 1914
3 "	2:27.81	Disbrow	Simplex	Cleveland, O.	Sept. 14, 1912
4 "	3:17.02	Disbrow	Simplex	Cleveland, O.	Sept. 14, 1912
5 "	4:06.58	Disbrow	Simplex	Cleveland, O.	Sept. 14, 1912
10 "	8:17.02	Disbrow	Simplex	Cleveland, O.	Sept. 14, 1912
15 "	12:47.00	Burman	Peugeot	Peoria, Ill.	Sept. 12, 1914
20 "	17:10.60	Burman	Peugeot	Springfield, Ill.	Sept. 19, 1914
25 "	21:37.60	Burman	Peugeot	Springfield, Ill.	Sept. 19, 1914
50 "	45:32.00	Disbrow	Simplex	Detroit, Mich.	Sept. 29, 1912
75 "	1:08:56.00	Burman	Peugeot	Galesburg, Ill.	Oct. 22, 1914
100 "	1:31:30.00	Alley	Duesenberg	Hamline, Minn.	Oct. 24, 1914
150 "	2:30:51.00	Wishart	Mercer	Columbus, O.	Aug. 25, 1912
200 "	3:21:48.00	Mulford	Mason Special	Columbus, O.	July 4, 1913

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24-HOUR TRACK RACES

Class	Car	Driver & Mechanic	Distance	Place	Date
Stock Chassis	Lozier	Patschke & Mulford	1,196 miles	Brighton Beach	Oct. 15, 1909
Cl. "C"	Stearns	Poole & Patschke	1,253 "	Brighton Beach	Oct. 19, 1910
Cl. "C" Spdwy	Fiat	Verbeck & Hirsh	1,491 "	Los Angeles	Apr. 8, 1911

FASTEST COMPETITION TIMES MADE IN 1915

NOT OFFICIAL RECORDS

Distance	Time	Driver	Car	Place	Date
4 miles	2:20.08	Resta	Peugeot	Sheepshead Bay	Oct. 9
10 "	5:45.92	Resta	Peugeot	Sheepshead Bay	Oct. 9
20 "	11:24.67	Resta	Peugeot	Sheepshead Bay	Oct. 9
50 "	28:04.63	Resta	Peugeot	Sheepshead Bay	Oct. 9
100 "	56:57.72	Resta	Peugeot	Sheepshead Bay	Nov. 2
150 "	1:27:10.93	Anderson	Stutz	Sheepshead Bay	Oct. 9
200 "	1:56:21.40	Aitken	Peugeot	Sheepshead Bay	Oct. 9
250 "	2:26:24.70	Rooney	Stutz	Sheepshead Bay	Oct. 9
300 "	2:55:32.23	Anderson	Stutz	Sheepshead Bay	Oct. 9
350 "	3:24:42.99	Anderson	Stutz	Sheepshead Bay	Oct. 9
400 "	4:04:49.00	Resta	Peugeot	Chicago	June 26
450 "	4:34:05.78	Resta	Peugeot	Chicago	June 26
500 "	5:07:26	Resta	Peugeot	Chicago	June 26

SPECIAL TRIALS AGAINST TIME DURING 1915

NOT OFFICIAL RECORDS

Distance	Time	Driver	Car	Place	Date
½ mile	16.60	Oldfield	Christie	Tacoma, Wash	July 5
1 mile	31.60	Oldfield	Christie	Tacoma, Wash	July 5
2 miles	1:10.00	Oldfield	Christie	Tacoma, Wash	July 5
5 "	3:00.00	Orr	Maxwell	Omaha, Neb	July 5

The various contests for the Vanderbilt Cup resulted as follows:

(Silver Trophy)

Donated by W. K. Vanderbilt Jr., in January, 1904; Deed of Gift to the American Automobile Association, and subsequently to the Motor Cups Holding Company.

FIRST RACE

Held October 8, 1904, at Nassau County, Long Island. There were 18 contestants. The distance was 284.4 miles—10 laps. The race was declared off after the second car crossed the finish line.

Winner—George Heath driving a Panhard; 5 hrs. 26 min. 45 sec.; average speed 52.2 miles per hour.

Second—Clement driving a Clement-Bayard; 5 hrs. 28 min. 13 sec.; average speed 51.6 miles per hour.

SECOND RACE

Held October 14, 1905, at Nassau County, Long Island. There were 19 contestants. The distance was 283 miles—10 laps.

Winner—Hemery driving a Darracq; 4 hrs. 36 min. 8 sec.; average speed 61.49 miles per hour.

Second—Heath driving a Panhard; 4 hrs. 39 min. 40 sec.; average speed 60.72 miles per hour.

Third—Tracy driving a Locomobile; 4 hrs. 28 min. 56 sec.; average speed 56.90 miles per hour.

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THIRD RACE

Held October 6, 1906, at Nassau County, Long Island. There were 18 contestants. The distance was 297 miles—10 laps.

Winner—Wagner driving a Darracq; 4 hrs. 50 min. 10 sec.; average speed 61.43 miles per hour.

Second—Lancia driving a Fiat; 4 hrs. 52 min.; 28 sec.; average speed 60.30 miles per hour.

Third—Duray driving a Lorraine-Dietrich; 4 hrs. 53 min. 28 sec.; average speed 60.27 miles per hour.

There was no race in 1907.

FOURTH RACE

Held October 24, 1908, at Nassau County, Long Island. There were 17 contestants. The distance was 258.06 miles—11 laps.

Winner—George Robertson driving a Locomobile; 4 hrs. 48 1/5 sec.; average speed 64.38 miles per hour.

Second—Herbert Lytle, driving an Isotta; 4 hrs. 2 min. 38 2/5 sec.; average speed 63.88 miles per hour.

Third—No official record of third car, owing to interference on the part of the spectators, but it is unofficially said to be Locomobile No. 1, driven by Florida; 4 hrs. 28 min. 10 sec.

FIFTH RACE

Held October 30, 1909, at Nassau County, Long Island. There were 15 contestants. The distance was 278.08 miles—22 laps.

Winner—Harry Grant driving an Alco; 4 hrs. 25 min. 42 sec.; average speed 62.77 miles per hour.

Second—Parker driving a Fiat; 4 hrs. 30 min. 58 sec.; average speed 61.55 miles per hour.

There was no *third car*. The race was called owing to various accidents to the other cars.

SIXTH RACE

Held on October 1, 1910, at Nassau County, Long Island. There were 30 contestants. The distance was 278.08 miles—22 laps.

Winner—Grant driving an Alco; 4 hrs. 15 min. 58 sec.; average speed 65.18 miles per hour.

Second—Dawson driving a Marmon; 4 hrs. 16 min. 23 sec.; average speed 65.08 miles per hour.

Third—Aitken driving a National; 4 hrs. 17 min. 29 sec.; average speed 64.80 miles per hour.

SEVENTH RACE

Held on November 27, 1911, at Savannah, Georgia. There were 14 contestants. The distance was 291.38 miles—17 laps.

Winner—Mulford driving a Lozier; 3 hrs. 56 min. 67/100 sec.; average speed 74.07 miles per hour.

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WINNER OF ASTOR TROPHY (1915)

This Stutz measured less than 300 cubic inches of piston displacement and set a new mark for distance.

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Second—De Palma driving a Mercedes; 3 hrs. 58 min. 11.95 sec.; average speed 73.4 miles per hour.

Third—Wishart driving a Mercedes; 4 hrs. 6 min. 20.37 sec.; average speed 71 miles per hour.

EIGHTH RACE

Held at Milwaukee, Wisconsin, on Wednesday, October 2, 1912. There were eight contestants. The distance was 299.54 miles—38 laps.

Winner—Ralph de Palma driving a Mercedes car; 4 hrs. 20 min. 31.54 sec.; average speed 68.97 miles per hour.

Second—Hughie Hughes driving a Mercer car; 4 hrs. 21 min. 14.24 sec.; average speed 68.79 miles per hour.

Third—Wishart driving a Mercedes; 4 hrs. 36 min. 35.75 sec.; average speed 65 miles per hour.

NINTH RACE

Held on March 6, 1915, on the grounds of the Panama-Pacific International Exposition, San Francisco, California. There were twelve contestants. The distance was 296.3653 miles, or 77 laps, over a course 3,8489 miles in length. There were no serious accidents.

Winner—Dario Resta driving a Peugeot car; 296.3653 miles in 4 hrs. 27 min. 37 sec.; average speed 67.3 miles per hour.

Second—Howard Wilcox driving a Stutz; 4 hrs. 34 min. 36 sec.; average speed 65.6 miles per hour.

Third—Edward Pullen driving a Mercer; 4 hrs. 35 min. 37 sec.; average speed 65.3 miles per hour.

The Grand Prize of the Automobile Club of America resulted in the following contests:

$5,000.00 GRAND PRIZE GOLD CUP

Donated by The Automobile Club of America. Deed of Gift to the Motor Cups Holding Company.

FIRST RACE

Held at Savannah, Georgia, Thanksgiving Day, November 26, 1908. There were twenty entrants. The total distance was 402.08 miles, or 16 laps, over a course of 25.13 miles. State troops guarded the course. There were no catastrophes.

Winner—Louis Wagner driving a Fiat; 402.08 miles, 370 min. 31 sec.; average speed 65.08 miles per hour.

Second—Victor Hemery driving a Benz; 402.08 miles, 371 min. 27 sec.; average speed 64.94 miles per hour.

Third—Felice Nazzaro driving a Fiat; 402.08 miles, 378 min. 47 sec.; average speed 63.64 miles per hour.

SECOND RACE

Held at Savannah, Georgia, November 12, 1910, having been transferred to Savannah from the Long Island Motor Parkway owing to the serious accidents which marred the Vanderbilt Cup Race. There were fifteen entrants. The total distance was 415.2 miles, or 24 laps, over a course of 17.3 miles.

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Winner—Bruce Brown driving a Benz; 415.2 miles, 353 min. 5 and a fraction sec.; average speed 70.55 miles per hour.

Second—Hemery driving a Benz; 415.2 miles, 353 min. 6 sec.; average speed per hour practically the same as that of the winner.

Third—Burman driving a Marquette-Buick; 415.2 miles, 371 min. 23 sec.; average speed 66.67 miles per hour.

THIRD RACE

Held at Savannah, Georgia, November 30, 1911, and for the second time in succession was won by Bruce Brown. There were sixteen contestants. The total distance was 411.36 miles, or 24 laps.

Winner—Bruce Brown driving a Fiat; 411.36 miles, 331 min. 29.15 sec.; average speed 74.45 miles per hour.

Second—Hearne driving a Benz; 411.36 miles, 333 min. 33.07 sec.; average speed 74 miles per hour.

Third—De Palma driving a Mercedes; 411.36 miles, 334 min. 40.8 sec.; average speed 73.74 miles per hour.

FOURTH RACE

Held at Milwaukee, Wisconsin, on Saturday, October 5, 1912. There were fourteen entrants. Twelve started. The distance was 409 miles, 4,616 feet.

Winner—Caleb Bragg driving a Fiat car; 409 miles 4,616 feet; 5:59:27.44; average speed 69.3 miles per hour.

Second—Edward Bergdoll driving a Benz car; 409 miles 4,616 feet; 6:14:51.38; average speed 65.51 miles per hour.

Third—Gil Anderson driving a Stutz car; 409 miles 4,616 feet; 6:15:22.47; average speed practically the same as that of Bergdoll, who took second place.

FIFTH RACE

Held at Santa Monica, California, February 28, 1914. There were 19 entrants. The total distance was 403.248 miles, or 48 laps over a course of 8.401 miles. There were no accidents.

Winner—Edward Pullen driving a Mercer; 403.248 miles in 5 hrs. 13 min., setting a new mark of 77.2 miles average speed per hour.

Second—Guy Ball driving a Marmon; 403.248 miles in 5 hrs. 53 min. 23 sec.; average speed 68.4 miles per hour.

Third—B. Taylor driving an Alco; 403.248 miles in 6 hrs. 8 min. 29 sec.; average speed 65.6 miles per hour.

SIXTH RACE

Held on the grounds of the Panama-Pacific International Exposition, San Francisco, California, February 27, 1915. There were 30 entrants. The total distance was 400.2856 miles, or 104 laps over a course 3,8489 miles long. There were no serious accidents.

Winner—Dario Resta driving a Peugeot car; 400.2856 miles in 7 hrs. 7 min. 53 sec.; average speed 56.13 miles per hour.

Second—Howard Wilcox driving a Stutz; 400.2856 miles in 7 hours. 17 min. 36 sec.; average speed 55.26 miles per hour.

Third—Hugh Hughes driving an Ono; 400.2856 miles in 7 hrs. 21 min. 46 sec.; average speed 54.37 miles per hour.

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DETROIT ELECTRIC CLIMBING MT. WASHINGTON IN 1906

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The Glidden Tours have been summarized as follows:

New York to St. Louis, July 25-August 10, 1904. Distance 1,964 miles. Starters 77. Finished 66. No prize. There was a Boston contingent in the tour. No rules except go-as-you-please.

New York to New York via Bretton Woods. July 11-22, 1905. Distance 870 miles. Starters 34. Finished 27. Prize, the Charles J. Glidden trophy, won by Percy P. Pierce in 30-horsepower Pierce-Arrow, carrying 5 passengers.

Buffalo to Bretton Woods via Montreal and Quebec. July 12-28, 1906. Distance 1,134 miles. Starters 48. Finished 30. Perfect scores 13. Glidden Trophy won by Percy P. Pierce, 40-45-horsepower Pierce-Arrow. Deming Trophy won by C. W. Kelsey, Maxwell, over field of 5.

Cleveland to New York. July 10-24, 1907. Distance 1,570 miles. Starters 49 in Glidden contest and 14 in Hower contest. Glidden Trophy won by Buffalo team consisting of 2 Pierce-Arrows, 2 Thomas cars and one Packard. Hower Trophy won by H. K. Sheridan in White, which prevailed in the run-off of a tie with G. J. Smith, Stoddard-Dayton.

Buffalo to Saratoga, via Pittsburgh, Philadelphia, Boston and the White Mountains. July 9-23, 1908. Distance 1,669 miles. Starters 32 in Glidden and 14 in Hower. Glidden contest resulted in tie score of perfect for 3 of the 10 3-car teams and cup was not awarded. Hower Trophy was won after a five-handed run-off by E. A. Renting, Pierce-Arrow.

Detroit to Kansas City, via Denver, Colo. July 12-30, 1909. Distance 2,636 miles. Starters 13. Glidden Trophy won by Pierce-Arrow, score perfect. Detroit Trophy, 3 starters (toy tonneaux), won by Chalmers-Detroit. Hower Trophy (runabouts), 14 starters, won by Pierce-Arrow, score perfect.

Cincinnati to Chicago, via Dallas, Texas. June 14-30, 1910. Starters (Glidden) 15; (Chicago) 12. Finished: Glidden 6; Chicago 6. Glidden won by Chalmers; Chicago won by Moline.

New York to Jacksonville, Fla. October 14-26, 1911. Distance 1,460.6 miles. Starters 63. Finished 49. Glidden and Anderson trophies won by Maxwell, the main prize being awarded to the Tarrytown team of three cars and the other cup being drawn by the other Maxwell entrant, there being 14 perfect scores.

Minneapolis to Glacier National Park, Mont. July 11-19, 1913. Distance 1,245 miles. Starters 24, of which 7 were not contestants. Finished in contesting division, 14. Glidden Trophy won by Metz team of three, with perfect score. Hupmobile (W. Munger) won Anderson Trophy for runabouts in drawing with four other perfect score cars.

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CHAPTER X

THE ROMANCE OF THE TRUCK

FAITHFUL old Dobbin, who has borne man's burdens and done much of his work for forty centuries, is headed for the Elysian Fields, the scrap-heap or the glue factory, depending on one's point of view. At any rate he must go because it is no longer economic to use him as motive power and therefore, whether we like it or not, we must push him aside.

The reason is that the competitive conditions of modern life render it impossible for one company or individual to use an element of equipment that costs a material sum more to perform the same service, that its competitor secures for a less sum. The first company would be obliged to close up voluntarily, or be closed by the sheriff if it persisted in such business methods, and there is no possible room for argument that the horse compares as motive power, for any kind of transportation work, with the automobile.

Consequently he must go and in fact he has been passing ever since the automobile arrived.

There has been much hysteria among horse dealers and horse owners over this necessity and the situation has been badly complicated at times by the undiplomatic position taken by the automobile makers, but the fact remains unaltered by the tears of one or the jeers of the other, that Dobbin's day on the road is done.

The ordinary passenger automobile has cleared the driving horse from the streets of cities with a peculiar completeness. So unusual is the appearance of a smart horse-drawn carriage on the streets of any of the big cities that the person who drives or is driven, lays himself open to the suspicion that he may be advertising either some sort of merchandise or perchance himself, or herself, as the case may be.

In the country Dobbin is still used to some extent for hauling buggies, but he looks pretty feeble.

His service at present on the roads and streets is practically confined to heavy hauling, such as freight transfer and in farm transportation work and light delivery, such as the service of retail stores.

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It will only be a short time before the end of the carriage and buggy horse is here and it will not be much longer before the transfer and delivery horse has departed and the whole equine field will be occupied by the agricultural work horse; the sporting and riding horses and the dainty little pony with which Wealth's children amuse themselves.

And the economic reason for it will be, not that people are unappreciative of the service Dobbin has performed, but that they cannot afford to use him. That the choice is afforded them to quit the horse as a means of transportation, or else quit paying their bills. As between these alternatives it will surprise nobody if Dobbin is eventually discarded, completely and entirely.

Next to the Standard Oil Company, the most complete records that have been kept showing the cost of road transportation, are those of the express companies. And next to the express companies, probably the big department stores of the country at large. In the accompanying figures, tabulations and curves the combined experiences of several of the elements mentioned have been used. G. A. Wells, formerly chief engineer of the Adams Express Company, is authority for a considerable part of the information and thanks are tendered to him for his assistance in checking most of the data presented. Mr. Wells is one of the most profound engineers who has specialized in the matter of operative costs that has been produced by the automobile industry.

His data is backed by many years of close observation, where it was his duty to learn exactly how much it cost to deliver goods. It should be explained that some of the figures given hereafter vary from those of Mr. Wells, but the variation is so slight that it is hardly worth mentioning.

In the early days of the automobile industry, the horsemen said that while the car might compete with the carriage horse, that it could never be hoped that it would make a serious bid for Dobbin's job between the shafts of a one or two-horse delivery wagon. The argument was that while the motor-car capable of carrying five tons, 40 miles a day, or of carrying a load of passengers for 200 miles a day might lessen the work of the horse by emancipating him from that kind of service, it would really help commerce because it would release so many perfectly good horses for delivery work, which, of course, would always remain the peculiar field for Dobbin.

It was pointed out that a single horse wagon making seventeen miles a day could not be touched by any motor equipment and that the

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two-horse wagon, traveling 20 miles a day, was perfectly secure in its job.

The records of many merchants who clung to this theory a little too long have been written in the bankruptcy courts. There is no argument possible where it has been shown that the failures generally clung to horse deliveries, in large part at least, and when the further fact is adduced that their fellows who have taken over the automobile for deliveries are at least in position to compete with the leaders and are still doing so. In some few isolated instances the power of a great name or some other advantage enjoyed by a big store has allowed the continuing of a profitable business, but in the main the survivors in any competitive field must use economic equipment and the horse is not economic as a means of delivery.

The combined wisdom and experience of the users of horses for delivery purposes shows that it costs from $1.32 to $1.39 per day to keep a single horse without getting one iota of service out of him, but figuring all items that should be charged against his keep, including amortization, feed, shoeing, care and everything else. If the horse works his proportionate part of 17 miles a day, six days a week and 52 weeks a year, which is not 17 miles per day per horse by any manner of means, the average cost per day, including wagon, harness and $2 wages for a driver is $4.25 per working day, or 28 1-3 cents per mile delivered.

A two-horse team making 20 miles per day costs with driver and helper, $6.14 or 30 7-10 cents per mile. If the two-horse wagon delivering 20 miles a day has a reserve team resting, as it should if continuous daily service is to be rendered, the cost will be $9.91 per day or 48 3-5 cents per mile of service.

The knell of the horse is sounded in the per mile cost of automobile delivery. Masses of figures have been compiled and collected to show actual figures and the essence of all the wisdom shows that it costs $2 per working day to keep a truck capable of carrying 1½ tons of freight or merchandise and costing about $2000 in first expenditure. The $2 includes all the items charged against the idle horse and as will be seen, is from 61 to 68 cents greater. The driver of the car requires higher wages also, and the great companies have found that they have to pay about $3 a day for such labor. It costs just under 7 cents a mile to run such a truck and as it can make 50 miles a day without strain, the total

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cost of daily operation is shown to be $8.50, or 16 2-3 cents per mile delivered.

One truck can do as much in one day in the way of mileage and delivery as three single horse wagons, making 17 miles a day and the difference in cost is $4.25 per day.

Two trucks can make the same mileage as five two-horse teams, supplied with reserve horses to make the service continuous, and the cost of the trucks will be found to be $17 a day while that of the wagons has been proven to be $48.55.

One can see the reason why one big mercantile establishment using automobiles can stay in business, while its competitor clinging to the horse goes into the Federal Courts. If one uses forty trucks to do the service performed by 100 two-horse wagons with adequate reserves, and only has to pay $340 a day against the unavoidable expense of $991 to the other, it can be readily seen where there was at least one big leak and the chances are where there is such a system in effect as would allow one leak of that kind, there are likely to be other leaks, perhaps not so serious, but material and important from the viewpoint of the creditors.

The performance of no special truck has been used as the basis of these figures. Any good truck capable of carrying 3000 pounds can duplicate them and in some seasons and under some conditions will improve on them. But as an average they are fair and conservative, according to the men who have had to pay the bills.

There is no use comparing the big trucks with corresponding horse equipment. The sight of any one of the standard makes climbing a grade with an overload, making 8 miles an hour without a whimper, is positively conclusive without giving more than a pitying glance at the sweating, straining teams struggling under the lash to climb the same grade with half the load. Of course the big truck is more economical than corresponding horse equipment and the proportionate cost per mile delivered is from one-quarter to one-fifth of the cost of horse haulage. Even the devotees of the horse admit that dragging five tons up a 6 per cent. grade is a cruelty that should be stopped. But the working of economic law will probably be the means of putting a period to that sort of abuse, because the alleged lovers of the horse apparently are so intent on getting the last cent out of his hide that they will not step in to emancipate their old friend from such killing labor, so long as he can pull another load.

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WILLIAM P. KENNEDY

A transportation engineer who has done service in a professional way to educate the public in automobile use.

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The clear, cold figures are presented to show how small is the economic basis in truth for the retention of the horse in the one field of transportation work for which any claims are still made for him:

The first table shows the per month cost of operating one-horse wagons with no reserve horses at the three ordinary distances for such equipment, 15, 16 and 17 miles per day:

COST OF OPERATING ONE HORSE AND WAGON

On Street	*Per Month*		
Miles per Day	15	16	17
Horse Keep	$ 27.50	$ 30.00	$ 32.50
Add Shoeing	2.51	2.51	2.51
Add Wagon Repair	4.00	4.00	4.00
Add Harness Repair	.87	.87	.87
Total	$ 34.88	$ 37.39	$ 39.88
Add Driver	60.00	60.00	60.00
Total	$ 94.88	$ 97.39	$ 99.88
Add Depreciation Horse	4.00	4.00	4.00
Add Depreciation Wagon	3.00	3.00	3.00
Add Depreciation Harness	1.67	1.67	1.67
Add Interest Horse	1.20	1.20	1.20
Add Interest Wagon	1.25	1.25	1.25
Add Interest Harness	.40	.40	.40
Total	$106.20	$108.71	$111.20

Value of Horse.....$240.00—Life 5 Years
Value of Wagon..... 250.00—Life 7 Years
Value of Harness..... 40.00—Life 2 Years
Interest 6%.

The figures covering the average of thousands of one-horse wagons during ten years of close observation, show that if the per month cost for fifteen miles a day is $106.20, the per day cost is just a shade less than $4.25, reckoning 25 working days to the month. The per mile cost would be a hair under 28 2-3 cents. At 17 miles a day, the absolute maximum for one horse in continuous service, the total cost is $111.20 per month, or $4.45 per day, which is a shade more than 26 1-6 cents per mile.

But no reasonable, conservative, humane user of delivery horses would attempt to make one horse work as much as 17 miles per day for 300 days a year and so the problem may be solved by having relief horses on hand ready to take up the service every other day, for instance. It is possible to keep a horse in flesh and health with steady work at 15 miles a day the year around, but at 17 miles he falters and

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loses weight after a few weeks' steady service. At 20 miles a day, it is an exceptional horse that will last a full month without respite. But it is not so difficult to get 20 miles a day out of horse equipment if the animals work in shifts every other day.

The second table shows what it costs per month to use horse equipment, where there is a safe and sane reserve of horse power.

COST OF OPERATING TWO HORSES AND SINGLE WAGON

On Street	*Per Month*		
Miles per Day	17	18	20
Horse Keep	$ 55.00	$ 60.00	$ 65.00
Add Shoeing	5.02	5.02	5.02
Add Wagon Repair	4.00	4.00	4.00
Add Harness Repair	1.74	1.74	1.74
Total	$ 65.76	$ 70.76	$ 75.76
Driver	60.00	60.00	60.00
Total	$125.76	$130.76	$135.76
Add Depreciation Horses	8.00	8.00	8.00
Add Depreciation Wagon	3.00	3.00	3.00
Add Depreciation Harness	3.34	3.34	3.34
Add Interest Horses	2.40	2.40	2.40
Add Interest Wagon	1.25	1.25	1.25
Add Interest Harness	.44	.40	.40
Total	$144.05	$149.15	$154.15

Value of Horse.....$240.00—Life 5 Years
Value of Wagon..... 250.00—Life 7 Years
Value of Harness..... 40.00—Life 2 Years
Interest 6%.

The total cost of 20 miles a day with relief horses is $154.15 per month, which is $6.16 per day, or 30 4-5 cents per mile.

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When the double wagon with a single pair of horses and no relief is considered the per mile cost rises sharply because the wagon is larger and upkeep is heavier. The next table shows the average cost of operating 17, 18 and 20 miles per day with such equipment:

COST OF OPERATING TWO HORSES AND DOUBLE WAGON

On Street	*Per Month*		
Miles per Day	17	18	20
Horse Keep	$ 55.00	$ 60.00	$ 65.00
Add Shoeing	5.02	5.02	5.02
Add Wagon Repair	6.00	6.00	6.00
Add Harness Repair	1.74	1.74	1.74
Total	$ 67.76	$ 72.76	$ 77.76
Add Driver	65.00	65.00	65.00
Total	$132.76	$137.76	$142.76
Add Depreciation Horses	8.00	8.00	8.00
Add Depreciation Wagon	3.58	3.58	3.58
Add Depreciation Harness	3.34	3.34	3.34
Add Interest Horses	2.40	2.40	2.40
Add Interest Wagon	1.50	1.50	1.50
Add Interest Harness	.40	.40	.40
Total	$151.98	$156.98	$161.90

Value of Horse.....$240.00—Life 5 Years
Value of Wagon..... 300.00—Life 7 Years
Value of Harness..... 40.00—Life 2 Years
Interest 6%.

Here the per mile cost for seventeen miles a day is a shade less than thirty-six cents, and when the team is pushed up to a daily delivery of twenty miles the cost is reduced to a bit less than 32½ cents per mile.

But except under stressful circumstances such as a holiday rush business or orders from the front office to cut down on equipment, no user of horse delivery would insist upon a 20-mile average for his teams without relief, so the average figures for those who use relief teams must come closer to the actual cost of delivery. This is shown in the following tabulation covering the same mileage as the foregoing:

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COST OF OPERATING FOUR HORSES AND DOUBLE WAGON

On Street	*Per Month*		
Miles per Day	17	18	20
Horse Keep	$110.00	$120.00	$130.00
Add Shoeing	10.04	10.04	10.04
Add Wagon Repair	6.00	6.00	6.00
Add Harness Repair	3.48	3.48	3.48
Total	$129.52	$139.52	$149.52
Men	65.00	65.00	65.00
Total	$194.52	$204.52	$214.52
Add Depreciation Horses	16.00	16.00	16.00
Add Depreciation Wagon	3.58	3.58	3.58
Add Depreciation Harness	6.68	6.68	6.68
Add Interest Horses	4.80	4.80	4.80
Add Interest Wagon	1.50	1.50	1.50
Add Interest Harness	.80	.80	.80
Total	$227.88	$237.88	$247.88

Value of Horse.....$240.00—Life 5 Years
Value of Wagon..... 300.00—Life 7 Years
Value of Harness..... 40.00—Life 2 Years
Interest 6%.

This is the true measure of cost for horse delivery, because it is efficient as that type of service can be made, with reasonable regard to the consideration due to animals. At 20 miles per day, the cost is a little over $9.91 per day, which means 48 3-5 cents per mile. At 17 miles per day, good average service, the cost is about 54 cents a mile. As between the 17-mile figure and the 20-mile figure, the average of humane, efficient horse delivery is not far from 50 cents per wagon mile of service actually performed.

In the present stage of the automobile art, a truck, almost any truck, designed to carry 3000 pounds; not overloaded and run not more than 50 miles a day at an average speed of not more than 12 miles an hour, will last six years, if adequate incidental repairs are made when required, particularly if it is given half the attention that has to be accorded to horse equipment.

Such a car can be had for around $2000. Depreciation, reckoned at one-sixth of the cost; interest on the investment and garaging such a car for a year amount to $564.25. To which should be added the cost of operation, including tires, gasoline, oil and repairs, including an annual overhaul, which figures as a total 7 cents per mile on a 50-mile basis.

The daily proportion of the fixed charges amounts to $1.88. The operating cost for 50 miles is $3.50 and the wages of the operator are

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$3, leaving a margin of 12 cents a day as compared with the per day basis used in all the foregoing remarks. Ten per cent. reserve equipment is a liberal estimate to take care of emergencies where such a moderate mileage is demanded of automobile equipment and the 12 cents a day is probably ample to cover it, although 19 cents would be the theoretical figure.

These cost figures are not guess work, but represent the combined experience of dozens of big installations of this size of truck in Boston, New York, Philadelphia, New Haven, Cleveland, Chicago and Indianapolis. Eleven different types of trucks of the size considered are included in the figures. Neither the horse nor the automobile figures take insurance into account.

The working day is ten hours, one of which is devoted to lunch and rest. This leaves 540 working minutes in a day. The two-horse wagon, which averages 5¼ miles an hour in making 20 miles, uses about 228 minutes in actual motion. This leaves the remainder of the time, or 312 minutes, for delivery, including loading and unloading. If the route should be longer, there cannot be so many calls made; if the calls are more numerous, the mileage must be cut down. It is a rather involved problem that confronts the traffic manager of any store that uses an extensive delivery system and one of his puzzles is to strike the balance where motion minutes should find their economic limit.

The truck making 50 miles at 15 miles an hour requires 200 minutes to cover the route, leaving 340 minutes for delivery work.

But Mr. Wells, in working out the problem about two years ago in the fall of 1913, before a number of improvements and developments had been made generally in the mechanical make-up of power wagons, took for his basis of illustration a speed of 12 miles an hour. The accompanying charted curves showing miles on the longer side and minutes on the shorter, illustrates the main principle with nicety.

Starting in the morning from 0 at the left, lower corner of the chart, the single-horse wagon moving at 4¼ miles per hour, requires 240 minutes to make 17 miles, thus leaving 300 minutes for delivery work. The two-horse wagon takes 228 minutes to make 20 miles, leaving 312 minutes for delivery. The automobile's delivery-minutes curves are the same as the horse-vehicle in each class, 300 to 312 respectively, to illustrate the vast range of the car in comparison. The motion-minutes curves, plotted at 12, 15 and 20 miles per hour, look like the ribs of an umbrella, they are so flat and long.

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The whole story is that increased speed and radius of action, give more time for delivery work. The horse equipment moves as fast as it can, but the automobile can go much faster than 12 or even 15 miles an hour, if extra demands have to be made upon it. It is thus possible to put more work, proportionately, on the car than upon the horse. If 20 miles an hour speed were desirable or necessary, the truck could make 50 miles in 150 minutes, leaving 390 minutes for delivery, or 78 minutes more for delivery than the double wagon crew would have in a 20-mile route.

It is therefore impossible for a merchant using horse equipment to make as much profit as his neighbor who uses the automobile for delivery. Nay more; it is difficult to see how, in these days of sharp competition, he can do business at all.

THE COMMERCIAL VEHICLE

The motor truck business in America is looked upon generally as a new and young industry. It is new as a business by comparison with other large American industries, and this is, or should be, a matter for self-congratulation by the manufacturers and others engaged in it, because youth has certain advantages. It has energy, vigor, enthusiasm, courage and perseverance in the face of obstacles and disappointments. Being a new industry, its greatest commercial development lies in the future. Its growth curve is rising in a concave line forming a more acute angle to the perpendicular, year by year, with the peak of the curve nowhere in sight. No one has begun to think of the time when the curve will begin to drop or even flatten out.

Everybody is still contemplating the great market possibilities, for, while there were estimated to be more than 100,000 commercial motor vehicles in use in the United States in the year 1915, the government census shows that half a million farm and business wagons are produced in the country every year. If it may be assumed that these have an average life of 10 years each, there must be about 5,000,000 horse-drawn wagons in use. This indicates a tremendous potential market, for no appreciable inroad has yet been made in the field of the farm wagon, which constitutes nearly three-quarters of all the wagons in use.

Today it is generally admitted that the predictions made less than a decade ago by enthusiasts, that the motor vehicle would supplant

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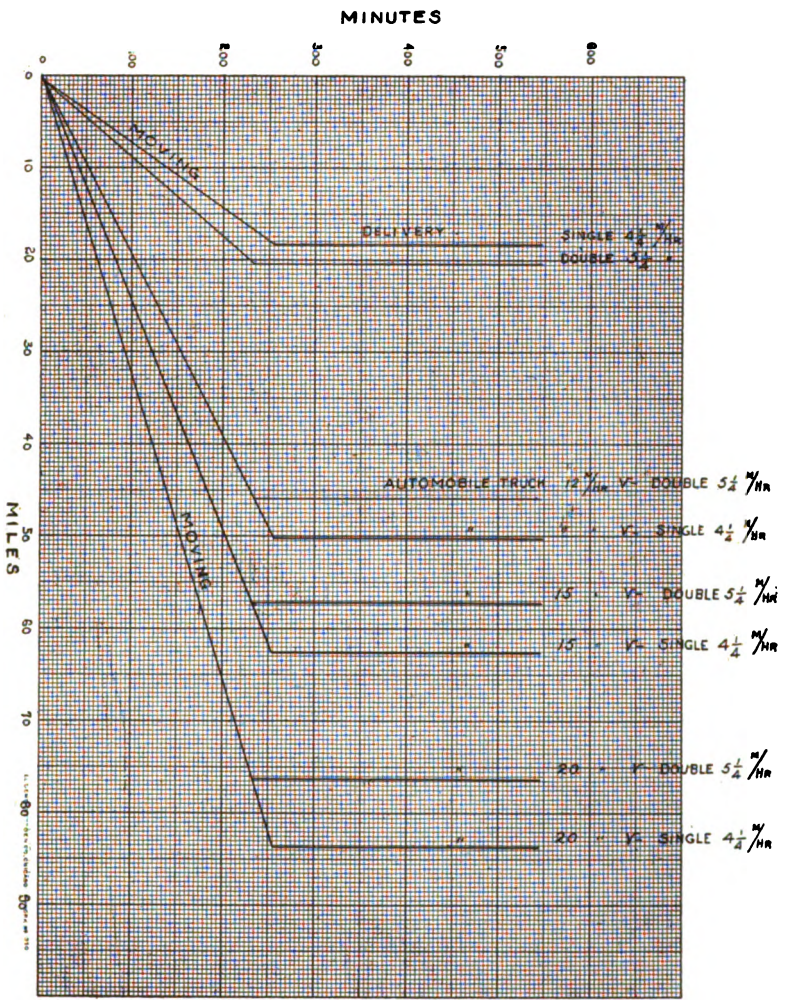

HOW THE SPEED AND POWER OF THE AUTOMOBILE TRUCK WIDENS DELIVERY SERVICE

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horse-drawn vehicles in large cities, is likely to be realized within another 10 years. Most people, however, regard the farm and rural communities as the natural stronghold of the horse, and, failing to give due weight to economic pressure, probably do not foresee any such transformation in rural hauling methods.

Reports show, nevertheless, that farmers bought approximately one-half of the 753,000 passenger automobiles built for the 1915 season, and there are several excellent reasons why the proportion will increase in succeeding years. Foremost among these are the increasing prosperity and good roads. The same reasons will induce the buying of motor trucks. Other reasons which will influence truck purchases are strictly economic.

By reason of its superior speed, greater carrying capacity and indefatigableness, the motor truck is making it profitable to cultivate cheap farm lands remote from the railroads. About one-quarter of all cultivated farm land is given over to raising hay and grain used as feed for horses and mules. By substituting motor trucks, farm tractors and automobiles, for horses, this land can be turned over to the production of food for human beings with greater profit as the prices of such products increase. The rising cost of horse-flesh and hay and oats and the decreasing prices of motor vehicles is yearly making the economy of the power vehicle more pronounced and apparent.

Fully as many passenger automobiles (820,000) were produced in 1915 as horse drawn family and pleasure carriages, of which farmers bought about 300,000. If this provides a reasonable basis for forecasting the future of the truck industry, the manufacturers may expect within a few years to be producing upward of half a million commercial vehicles, of which the farmers will take 200,000 a year. The present normal output is estimated to be about 50,000 a year, but as the prices are reduced and more light trucks of 1000 to 2000 pounds capacity are put on the market, the ratio of possible buyers is multiplied.

Although in a commercial sense the truck industry is still in its infancy, it is not so young in its engineering development. Inquirers are often surprised to learn that it really antedates the pleasure automobile. The earliest inventors of the self-propelled road vehicle had their thoughts influenced in that respect by the commercial possibilities of the steam stage coach and traction engine. For illustration, the Cugnot steam wagon built in France in 1769-70 was designed to haul heavy artillery; the Hancock, the Gurney and the Russell steam

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vehicles built in England in the period from 1820 to 1840 were stage coaches that were actually operated in service as paying passenger conveyances.

The earliest recorded road vehicle in the United States was a combined boat and road wagon built in 1804 by or for Oliver Evans, who obtained privileges to operate road wagons in Pennsylvania and Maryland.

The first power road vehicle that is known to have operated on its own power of which there is authentic knowledge was a huge steam traction engine built in New York City in 1858 to be used for hauling merchandise from the Mississippi River to Colorado. The idea originated with Major General Joseph R. Brown, an Indian agent in Minnesota. The engine was designed and built by J. A. Reed, of New York, and after being driven under its own power through the streets of the city up to Twenty-third Street and back to the Christopher Street Ferry, was shipped by rail and river steamer to Nebraska City. The populace gave it a great reception there, and a string of about a dozen wagons filled with people was hauled through the city, preparatory to driving the engine to Denver under its own power. About 7 miles out of Nebraska City, a crank was broken and the machine was stored in Arbor Lodge, owned by J. Sterling Morton. The Civil War and the beginning of construction of the Union Pacific Railroad prevented the making of repairs and ended the venture, which had cost thousands of dollars. Eventually the machine was sold for $200 and the boiler and engine removed for use in a mill.

This is believed to be the only American road vehicle that has had a monument erected to commemorate it. In 1915 it was decided in Nebraska City to erect an appropriate monument on the spot from which the engine started on its ill-fated trip toward Denver, the monument to bear this inscription:

STEAM WAGON

Invented and Owned by

JOSEPH R. BROWN, of Minnesota

Manufactured by

JOHN A. REED, of New York
Landed at Nebraska City from Steamer
"West Wind" July 12, 1862
Started for Denver, Self-Propelled, July 22, 1862
Disabled and Abandoned Seven Miles Out

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Although a number of experimental steam road vehicles were built in England in the first half of the nineteenth century with seats for only two to six passengers, and later on Bollee, Serpollet and LePlant constructed comparatively small steam cars in France, the real beginning of the modern pleasure car industry was not made until Gottlieb Daimler and Carl Benz, in Germany, and Panhard and Levassor, in France, adapted the internal combustion engine to bicycles, tricycles and small cars in the period from 1885 to 1893.

The earliest experiments with steam road engines had very little if any influence, however, on the development of the commercial vehicle either in Europe or America. Besides the Reed steam traction engine referred to already, other early American self-propelled vehicles belonged to the class of commercial or utility vehicles. A steam fire engine driven by its own power was built in 1840 by Captain Ericsson. How successful it was is not known, but in 1867-70 the Amoskeag Corporation, in Manchester, N. H., built several self-propelled steamers, one of which, after being hurriedly sent to Boston during the great Boston fire in 1872, and performing efficient service, was purchased by the city of Boston. In 1876 the city of Hartford bought a self-driven steamer, which was named Jumbo, and was kept in service for many years.

Development of the modern commercial vehicle was practically contemporaneous with that of the pleasure car. As early as 1895, in the pioneering days of Duryea, Winton, Haynes & Apperson, Woods, Riker, Olds, Morris & Salom and others, when the *Horseless Age* was started and the *Times-Herald* road race in Chicago on Thanksgiving Day inaugurated the automobile contest era in this country, the possibilities of the motor vehicle for industrial and commercial purposes were foreseen by many constructors. A gasoline delivery wagon, built by the Langert Company of Philadelphia, was entered in the Cosmopolitan race. Charles E. Woods, a Chicago carriage builder, had constructed one or more electric delivery wagons and C. S. Fairfield, of Portland, Oregon, had built a sightseeing stage seating eighteen to twenty passengers which was driven by a kerosene engine.

To Woods seems to belong the credit for being the first American manufacturer to produce business vehicles commercially. The delivery wagons built by the Woods Motor Vehicle Co. in the early 90's were driven by two 1200-watt electric motors giving 3½ horsepower output for five hours with a 32 cell battery. The running gear had carriage

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wheels and the front wheels were steered by a vertical rod on the left side fitted with a streetcar brake handle.

Charles E. Woods, of the C. E. Woods Co., well known electrical engineer of Chicago and New York, made a long and very careful study of the motor vehicle from an engineering and practical standpoint in the early experimental days in America and reached the conclusion that the first demand of the public would be for light delivery wagons, then for public conveyances, next for liveries and finally for heavy private trucks.

Hiram Percy Maxim, born in Brooklyn in 1869 and graduated from the Massachusetts Institute of Technology, began experimental work with a gasoline driven Columbia tricycle, which was completed in 1895. He later became connected with the Electric Vehicle Co., of Hartford, Conn., and designed the Columbia electric pleasure and commercial cars and Columbia gasoline pleasure cars built by that company until it went out of business in 1910. Maxim is a well-known mechanical engineer and a member of the Engineers' Club, associate member of the American Institute of Electrical Engineers and the Society of Automobile Engineers of London.

In 1896 a horse van was converted into a steam wagon to haul furniture for the Shepard & Co. department store of Providence, R. I., by the Cruickshank Engineering Works of the same city. The design was by L. F. N. Baldwin and showed a boiler and 6-horsepower engine mounted under the wagon bed, with side chain drive.

That the truck industry as well as the passenger car industry abroad was considerably further advanced than in America at this period is shown by the fact that the first heavy vehicle trials were held in France from August 5 to 11, 1897, by the Automobile Club of France. Ten vehicles competed, including four omnibuses, two tractors, one wagonette, one freight or merchandise truck and one brake. It will be seen how the passenger-carrying vehicle predominated. The steam vehicles showed superiority in hill-climbing and hauling loads exceeding one ton, but the Panhard gasoline omnibus was highly commended for cleanliness, fuel economy and management.

The Winton delivery wagon, brought out in 1898, was the first gasoline commercial vehicle to be produced on a commercial scale in the United States. Eight of these vehicles were under construction in October of that year. The panel body was mounted on the regular Winton pleasure chassis, which was driven by a 6-horsepower 5 by 6

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inch single-cylinder horizontal engine suspended under the body with a planetary change-speed gear mounted on an extension of the crankshaft. The running gear had tubular axles and reaches and final drive was by a single chain to the differential gear on the rear axle. The machine was steered by a tiller and the wheels were of the wire spoke suspension type.

In the same year the Duryea Motor Wagon Co., of Springfield, Mass., brought out a light delivery model having a panel body mounted on the three-wheel passenger car chassis designed by Charles E. Duryea; and S. Messinger, of Newark, N. J., produced a gasoline delivery wagon weighing 1000 pounds and driven by a 6-horsepower 4 by 6-inch engine.

A. L. Riker, pioneer American experimenter with electricity as a motive power for tricycles and pleasure cars, had produced an electric delivery wagon model, and one of these machines, built for B. Altman & Co., dry goods merchants in New York, was placed on exhibition in the electrical show held in Madison Square Garden in May, 1898. It had a rated capacity of 500 pounds and weighed 2900 pounds. The battery alone weighed 1000 pounds. The vehicle was mounted on wire wheels fitted with 3-inch pneumatic tires and had a radius of action of 30 miles at a speed of 10 miles an hour.

Mr. Riker, who was born in New York City in 1868 and graduated from the Columbia College Law School, began experimenting with electrically driven vehicles and in 1895 built a self-propelled quadricycle made of two bicycles placed side by side for experimental purposes. In the 90's he produced designs for large electric 4-wheeled passenger and delivery vehicles. He had already formed the Riker Electric Motor Co. of Brooklyn, of which he was president.

This was succeeded in 1901 by the Electric Vehicle Co. of Hartford, which continued the manufacture of electric vehicles under the name Columbia, acquired from the Pope Manufacturing Co. Mr. Riker subsequently became chief engineer and a director of the Locomobile Co. of America, at Bridgeport, Conn., of which he is now vice-president (1915). He is a prominent member of the Society of Automobile Engineers and is recognized as an engineer of the highest rank in the industry. In 1915 the S. A. E. selected Mr. Riker and Howard E. Coffin for appointment on the U. S. Naval Advisory Board and the appointments were made by the Secretary of the Navy.

Riker entered an electric carriage in the first automobile race meet

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held on a track in America, at Providence, R. I., September 7 to 11, 1906. He won the first and second 5-mile heats in 15 minutes 1 second and 13 minutes 6 seconds, respectively, and lost the third to the heavier electric vehicle entered by the Electric Carriage & Wagon Co., which won in 11 minutes 27 seconds. First prize of $900 was awarded to Riker.

A crude oil tractor built in 1898 by the Best Manufacturing Co., of San Leandro, Cal., was probably the first American internal combustion tractor for hauling merchandise. It is interesting to note that it was driven by a 75-horsepower 4-cylinder motor and was designed to haul a gross weight of 120,000 pounds on two trailer wagons at a speed of 4 to 8 miles an hour.

The first Waverley electric wagon announced made its appearance the same year in Indianapolis as the product of the American Electric Vehicle Co. Its chief characteristics were a tubular frame, ball-bearing wood wheels fitted with cushion tires, single 3½-horsepower motor supported longitudinally on the frame with enclosed direct drive from the armature shaft to the rear axle differential; a 44-cell battery concealed in the body bed and tiller steer.

Other productions of the year include the Columbia gasoline delivery tricycle, which marked the entrance of the Pope Manufacturing Co., of Hartford, into the commercial automobile line; and two electric delivery wagons built by the General Electric Automobile Co., of Philadelphia, one having a capacity of 2200 pounds—considerably larger than other business wagons produced up to that time. The Fisher Equipment Co., of Chicago, was engaged in building from 60 to 70 electric vehicles, including delivery wagons for C. E. Woods.

It is noteworthy that at this early period only gasoline and electric vehicles were in the field in the United States and that the bicycle manufacturers—notably Alexander Winton, the Pope Manufacturing Co. and Indiana Bicycle Co. (Waverley)—had begun to turn their attention to the motor vehicle as offering a field of manufacturing opportunity following the decline of the bicycle business in 1897-8.

Now came a brief period, in 1898-9, when the struggling young industry was burdened by the flotation of many heavily capitalized stock companies to exploit public service electric cab and compressed air trucking services. Anticipating big profits in such undertakings or believing the public anticipated them and was ready to invest heavily, the Whitney-Widener-Elkins syndicate, of Philadelphia and

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New York, secured control of the patents owned by the Pope Manufacturing Co. for the construction of motor vehicles and those owned by the Electric Storage Battery Co. for the manufacture of vehicle batteries and formed the Columbia Automobile Co. This company then united these patents with those owned by the Electric Vehicle Co. under the ownership of a third company organized as the Columbia & Electric Vehicle Co., whose stock was taken equally by the Columbia Automobile Co. and the Electric Vehicle Co. The new company purchased the entire plant of the Columbia Automobile Co. in Hartford and soon afterward acquired the stock and plant of the New Haven Carriage Co. at New Haven. About the same time the Electric Vehicle Co. bought up the Seamans & Halske Electric Co. of America for the production of motors and other electric equipment.

With this combination of manufacturing plants, having facilities for the production of about 8000 vehicles a year, the Electric Vehicle Co. began organizing transportation companies in leading cities as an outlet for the product. The first four formed were the New York, the New England and the Illinois Electric Vehicle Transportation companies, each capitalized at $25,000,000, and the Pennsylvania Electric Vehicle Co., capitalized at $6,000,000. Half ownership of the parent company entitled the Electric Vehicle Co. to one-half of all profits of manufacture, fixed at 20 per cent. above manufacturing cost in all cases. In addition, each of the transportation companies was required to pay the company 2½ per cent. of its gross earnings of operation and 10 per cent. commission on all sales of vehicles other than those it operated itself.

Electric cab service was started in New York in the spring of 1897, with a very few vehicles and in the following year fifteen were running. The service continued to grow until more than 300 electric hansoms, broughams, theater busses and other models were operating in the early 90's.

This plan looked so alluring that Joseph Hoadley and Joseph Leiter formed the International Power Co. and endeavored to float companies to operate compressed air stages and trucks which were in a very experimental stage. Charters were taken out for the New York, the Boston, the Massachusetts and the Providence Auto Truck companies, each capitalized at $10,000,000; the General Carriage Co. of New Jersey, with $20,000,000 capital stock; the Maryland Auto Truck Co., with $5,000,000, and the Washington Auto Bus Co., with $3,000,-

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000 capital stock. So far as the records show, none of these companies ever really operated motor trucks in service.

A flotation project was started in the gasoline vehicle field in October, 1899, when the Continental Automobile Co. of New Jersey was incorporated with $3,500,000 capital and made efforts to acquire control of the Winton Motor Carriage Co., the Manhattan Oil Motor Co. of Jersey City and the National Motor Carriage Co. of New York City. The plan, however, "died a'borning."

These several stock jobbing movements serve to show at least an early appreciation of the great field for self-propelled vehicles in the public service of passenger and merchandise transportation. Another evidence of this is found in an editorial published in the December, 1898, issue of *Horseless Age*. Referring to commercial motor vehicles the editor observed:

"This is the most alluring side of the motor vehicle to the far-sighted capitalist or manufacturer who knows the difference between a Paris fashion and a labor-saving machine. * * * Not that the pleasure carriage is to be ignored. It is merely the minor phase of the subject."

In the light of the subsequent relative growth of the two branches of the industry up to the present time, Editor Ingersoll cannot be said to have been near-sighted. Nevertheless, there is pretty general conviction that the time is growing near when the motor vehicle for industrial and commercial purposes will overtake the speedier pleasure car despite its long lead. But in the meantime a good many far-sighted manufacturers and capitalists have put on glasses to correct their vision and hundreds have wearied of following the allurement.

The Pope company brought out a Columbia electric delivery wagon of 1000 pounds capacity in 1899, which embodied the idea of a standard running gear on which any type of delivery body could be mounted. The gear was reachless and was driven by spur gears from a single motor spring suspended from the frame. The wood wheels ran on plain bearings. The frame and body were supported on a double transverse front spring and platform rear spring. The total weight, with battery, was 3900 pounds. The machine was claimed to develop 78 per cent. efficiency on brake test at 150 per cent. overload of the motor.

That year marked considerable activity in the commercial vehicle field. Charles E. Duryea had removed to Peoria, Ill., where the

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Duryea Manufacturing Co., which he organized, built a light delivery wagon weighing 800 pounds, which was driven by a 3-cylinder gasoline engine under the rear of the body and steered and controlled by a single tiller lever arranged centrally in front of the seat. The Woods Motor Vehicle Co. was organized in Chicago with Samuel Insull, treasurer of the Chicago Edison Illuminating Co., as president, and in December shipped several mail collection wagons to the U. S. Post Office in Washington. It also contracted to supply three 1500-pound delivery wagons to the U. S. Signal Corps, which was the first government order ever placed for motor vehicles, it is claimed.

Stanley Brothers, of Newton, Mass., pioneers in the development of successful light steam carriages, produced business wagons in several styles, including an express wagon weighing 450 pounds designed to carry 800 pounds of merchandise; an express wagon or open truck to carry 2 tons and having a speed of 10 miles an hour and a truck weighing 1 ton with a rated capacity of 4 tons.

Up to this time the gasoline and electric vehicles had occupied the stage in America, in both the pleasure car and commercial vehicle lines; with the entrance of the Stanley Brothers, photographic dry-plate makers, began the era of the distinctly American light, cheap, steam vehicle, which developed rapidly and had a great vogue for five or six years. The vehicles generally were characterized by a tubular running gear with bicycle-type wheels, tiller steer; small copper fire tube boilers under the seat; gasoline (and, later, kerosene) burners; light, vertical, twin-cylinder engine under the footboards and single, center chain drive to the rear axle differential.

In the same year (April, 1899) the St. Louis Carriage Co. started business and introduced gasoline "Rigs that Run," in pleasure car types and also in light delivery models, which it began to put on the market in some quantity—for those days. The delivery wagon had an open bed piano-box body mounted on the pleasure car chassis, which was driven by a double-opposed horizontal engine.

Evidently inspired by the earlier flotation schemes, W. W. Gibbs, formerly connected with the Electric Vehicle Co.; F. D. Caley and C. E. Platt incorporated the Anglo-American Rapid Vehicle Co. in November under the liberal laws of New Jersey, with authorized capital of $75,000,000, and announced that 200 motor busses from abroad, propelled by gasoline and steam, would soon be operating in Philadelphia. The enterprise was represented to be an international combina-

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tion of the Electric Vehicle Co., the New York Electric Vehicle & Transportation Co., and other New England and western corporations with the British Motor Co. and the Humber Motor Co. of England. Beyond the brief announcement of its organization and plans, no further references to the company's activities appear in the chronicles of the industry.

American business houses began in this year to display an early and commendable faith in the possibilities of power transportation. It is recorded that Altman & Co., of New York, placed a "large order" for twelve gasoline delivery wagons to be built by the Automobile Co. of America, of which Albert Otto was president. They were to be driven by 7-horsepower engines and to have a maximum speed of 28 miles an hour. The Winton Motor Carriage Co. built several special lots of delivery wagons, one of seven for Doctor Pierce, of Buffalo, and another lot for Jules Hunker, bread baker of Philadelphia. In the spring of 1900 the company installed a regular business wagon department in the Winton factory. The American Electric Vehicle Co. of Chicago delivered an electric wagon to the Heinze pickle company. The Swift Packing Co. put the first motor delivery wagon in service in Kansas City after having operated several similar wagons for some time in Chicago. The Shepard Co., of Providence, received four Waverley electric wagons built by the Indiana Bicycle Co. The Haynes-Apperson Co., of Kokomo, Ind., also built a gasoline delivery wagon for C. B. Knox, the gelatine manufacturer of Jamestown, N. Y.

Possibilities of the motor vehicle for municipal as well as federal service were also being given attention, for besides the Woods wagons purchased by the government for the Signal Service Corps and the Post Office in Washington, the Cleveland Post Office made a trial of a Winton car for mail collection and the Akron, Ohio, fire department built a patrol wagon, claimed to be the first ever built for the purpose. It was built in one of the city fire engine houses by the department engineer, Frank Loomis, and proved successful on test, carrying 20 city officials as guests on the official trial.

Although the Third Avenue R. R. Co. decided in this year to substitute motor busses for the old horse busses on Fifth Avenue, New York, none of them made their appearance until a year or two later and these were subsequently withdrawn. It was reported in May, however, that the National Transportation Co. had under construction 32 steam busses with seating accommodations for 20 to 40 passengers,

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to operate in Boston and nearby towns. If they ever materialized they did not operate long enough to affect the development of the industry noticeably. But the New England Electric Vehicle Co. had two electric hansoms and 20 broughams in public service in the Hub and put in service for the first time a fleet of 25 delivery wagons.

This notable year also developed the desire of automobile manufacturers to make public displays of their new products. In May, at the New York Electrical Exhibition, in Madison Square Garden, there was exhibited a Riker electric truck, a Waverley delivery wagon and a Columbia fire department emergency wagon, equipped with extension ladder, fire extinguishers, linesmen's tools, stretcher, etc. The total weight was 4500 pounds and the battery weighed 1400 pounds.

That Europe was no further advanced in the use of commercial vehicles at this period than the United States is indicated by a paper read before the New York Electrical Society in February, 1899, by G. Herbert Condict, who observed: "In Europe there is today only one cab station in actual operation, with a few light delivery wagons, and here and there a lumbering steam truck or a fear-inspiring omnibus."

Engineers were seeking to point out the economy of motor delivery, however, and in a paper prepared by G. F. Sever and R. A. Fleiss and read at the sixteenth annual meeting of the American Society of Engineers at Boston, June 28, 1899, the operating cost of a one-horse wagon hauling 800 pounds was placed at $4.28½ as against $3.87¾ for an electric wagon. The ton-mile cost of electric haulage was given as 5¼ cents.

The first public automobile exhibition and contest in which commercial vehicles took an active part was held in 1900. This was the Chicago Inter-Ocean meet held at the old Washington Park horse race track adjoining Washington Park on the south. It was held September 18 to 22, and the exhibits were displayed under the grandstand. The commercial displays consisted of three Woods electric delivery wagons and one mail wagon, two gasoline delivery wagons built by the Chicago Motor Vehicle Co. and one electric delivery wagon and one omnibus built by Hewitt & Lindstrom, of Chicago.

Several interesting competitions were provided for commercial cars, one of which was a mail collection test which was won by an electric delivery wagon entered by Siegel, Cooper & Co. which made five circuits of the one-mile track and collected letters from 40 boxes in 40

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minutes. Another was a hill-climbing test on a timber incline having a maximum grade of 40 per cent. This was won by the big, heavy delivery wagon of the Chicago Motor Vehicle Co. under the control of Jack Worth, designer. This wagon also performed the "stunt" of driving over a 12-inch box on the track cracking the shell of an egg on the other side of the box at a spot marked with a pencil and backing over the box without smashing the egg.

The Hewitt & Lindstrom vehicles were the product of John H. Hewitt and Charles L. Lindstrom, of the Miehle Printing Press Co. The Worth machines were built in Harvey, Ill., where the Chicago Motor Vehicle Co., capitalized at several millions, was getting in shape to take orders in quantity. The chief characteristic of its product was the friction drive or transmission, composed of a big, heavy, leather-faced fly wheel and a sliding wheel splined on the jackshaft so as to make contact at right angles with the face of the fly wheel. In commercial service, it was found that there was excessive wear of the leather and after a few years the company went out of business. Another friction-drive gasoline wagon had been produced and tried experimentally in the previous December by John Lambert, of the Buckeye Manufacturing Co., of Anderson, Ind. Later this company entered upon the production of the Lambert trucks on a commercial scale and have continued in the business on a limited scale ever since.

Besides the Inter-Ocean meet in Chicago, there were three other public exhibitions in 1900 at which commercial cars were shown. In October, at the Boston Merchants' and Manufacturers' exhibition, the Cunningham Enginering Co., of that city, showed a three-ton steam truck which it had built. The over all dimensions were: length 15 feet 10 inches; width 5 feet 6 inches. Steam was furnished by a water-tube boiler 5 feet high and 25 inches in diameter. The engine was of the locomotive type. The wheels were mounted on roller bearings and the truck was steered by a 24-inch wheel.

In November the first exclusive automobile show was held in New York in Madison Square Garden. The commercial exhibits included a Waverley electric combination delivery wagon and passenger brake having a double tubular frame; two gasoline delivery wagons built by the Daimler Manufacturing Co., of Steinway, Long Island, under the German Daimler patents; two Electric Vehicle Co. delivery wagons; one light gasoline delivery wagon built by the Automobile Co. of America; one electric combination delivery wagon built by the National

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Automobile & Electric Co., of Indianapolis; one electric emergency wagon for the Metropolitan Railway Co. and one four-ton electric truck for the Moet & Chandon champagne importing house, both the product of the Riker Motor Vehicle Co., of Brooklyn; one light Reading steam delivery wagon and one 12-passenger omnibus built by the New York Motor Vehicle Co.

The same month there was an exhibition at the old Grand Central Palace, New York, at which were shown a Thornycroft steam truck constructed by the Cooke Locomotive & Machine Co. under the English patents and a delivery wagon by the American Electric Vehicle Co., of New York.

Other commercial vehicles that made their debut in 1900 were a gasoline delivery wagon of 500 pounds capacity and weighing only 1200 pounds, produced by the Detroit Automobile Co., many parts being made of aluminum and gun-metal and the axles of nickel steel for lightness, and a railless street car built by Paul Gaeth, engineer of the People's Automobile Manufacturing Co., of Cleveland. This was the forerunner of the Gaeth trucks that were offered in the market 10 or 12 years later. It had a vestibuled street car type body 22 feet long and was driven by a single-cylinder 3-horsepower engine weighing 175 pounds, which was found inadequate, of course.

The Milwaukee Automobile Co., builders of light steam runabouts of the Locomobile, Mobile and Stanley type, also brought out a machine with a panel delivery body on a surrey running gear and nearly completed an experimental heavy steam "lorry" designed by an English engineer or mechanic who had come to this country. Like all other attempts to introduce heavy steam trucks in America, this did not prove to be a commercial success.

In January a 1200-pound capacity gasoline delivery wagon designed by R. M. Owen was brought out by the Phoenix Motor Vehicle & Engine Co., of Cleveland, which had several others under construction. It was driven by a double cylinder opposed engine with 5 by 6-inch cylinders, had tubular frame with reaches and artillery type wheels.

The same month the Pittsburgh Auto Car Co., first established in the Pennsylvania capital and engaged in manufacturing gasoline runabouts, built a two-story factory 110 by 60 feet in Ardmore, Pa. This was the forerunner of the present big plant of the Autocar Co., which some years later gave up the manufacture of pleasure cars to devote

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all its energies to the production of one-ton, 3000-pound and two-ton delivery wagons and trucks which have been so successful commercially.

In the spring of 1900 the National Automobile & Electric Co., incorporated in February, erected a two-story plant 375 by 75 feet for the manufacture of electric vehicles in seven models for business and pleasure purposes. L. S. Dow, former manager of the Indiana Bicycle Co., was president and general manager, and A. C. Newby, who later became publicly prominent as promoter and backer of the famous Newby oval race course, was a director.

The receptive attitude of the business world toward motor vehicles at this period is shown by several facts recorded in the chronicles of the time. An ordinance was introduced in the Philadelphia councils in January, 1900, providing that after April 1 all fire engines, hose carts and patrol wagons purchased by the city should have automobile attachments, meaning, presumably, that they should be self-propelled. Perhaps it was an April fool joke, as the success of such apparatus had not then been established. Out of 50 motor vehicles in use in the city only half a dozen were used by business houses, a majority of the total number being passenger vehicles operated for hire. The Philadelphia *Bulletin* had put two newspaper delivery wagons in service during the winter of 1899-00, Strawbridge & Clothier, the department store, bought an electric delivery wagon from the General Vehicle Co. and a florist was operating one of western make.

The first motor truck to be operated commercially in Milwaukee was put in service by the Cudahy Packing Co. It was a three-ton gasoline machine built by the Charles Albresch Carriage Co., of that city. Four merchants in Indianapolis were using electric delivery wagons in April of that year.

By November a total of 350 licenses had been issued in Chicago to operate motor vehicles of which 100 were issued to operators connected with local automobile agencies, 78 to drivers of the Illinois Electric Vehicle company's cabs, and 43 to drivers of a livery service established by the Woods Motor Vehicle Co. The rest were issued to owners of private pleasure cars and drivers of trucks, delivery wagons and busses for Siegel, Cooper & Co., The Hub, Schlessinger & Mayer, American Express Co., Chicago American, Pabst Brewing Co., Chicago Edison Co. and Ruppert the Shoe Man.

The automobile industry was feeling its way slowly during the

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opening years of the Twentieth Century. Inventors, experimenters, manufacturers and users were concerned with electric, gasoline and steam vehicles about equally. The light steam car was about at the height of its popularity, the electric was numerically strong and was making slow progress, while the gasoline machine was forging ahead rapidly. Every conceivable form of construction was undergoing a try-out and there was no recognized standard type.

Such an insatiable public demand for private pleasure cars began to develop and offered such an easy market and good profits to manufacturers that for more than a decade this branch of the new industry almost eclipsed the commercial vehicle branch, notwithstanding a somewhat general belief that the latter must eventually prove the more substantial and durable. The most optimistic in those days dared not prophesy an annual production of more than a million motor vehicles which will be reached by the end of 1916, of which fully nine-tenths are passenger cars.

Although the business world generally took little substantial interest in the commercial vehicle and this branch of the industry languished for years, belief in its possibilities did not die, and there were many engineers and builders who turned their attention to it. A number of pleasure car makers who entered the field abandoned it later to devote all their energies to the more profitable side of the industry; some who started as commercial car makers turned to making passenger cars and many others gave up altogether. A very few who began as exclusive truck makers have stuck courageously to this line through many difficulties.

Most of the early commercial cars were delivery wagons built on passenger car chassis. This was particularly true of the light steam and gasoline machines. The light steam delivery wagon disappeared from the market by 1905. Many attempts to produce heavy steam trucks were made but none of them proved a commercial success and efforts along this line were given up by 1910. Electric vehicle makers had a good appreciation of the requirements of heavy haulage and designed their vehicles especially for such work. But the low grade metal used and the excessive weight of the lead batteries of those days made the vehicles so heavy that they were of doubtful economy in operation and did not make great headway, although some of them were kept continuously in service for more than a decade and a few are still running.

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The gasoline commercial car has made greatest headway and now largely predominates. Practically every type of construction tried in the passenger car has been followed in the commercial field, plus a considerable number of other forms. It took about 15 years for the industry to settle down to the present standard type, which is characterized by a pressed steel or rolled steel frame, four-cylinder vertical engine at the front, water-cooled, magneto ignition, three-speed selective gear transmission, shaft and worm gear drive to rear axle differential, seat back of hood and dash, left-side drive with wheel steer and center control levers.

In the meantime there have been delivery wagons and trucks with one, two, three and four-cylinder engines, air-cooled and water-cooled, horizontal and vertical, mounted under the middle of the body, on the rear axle, under the seat and at the front end of the frame. There has been friction, planetary, sliding gear, electric and hydraulic transmission. There has been single center chain, double side chain, rope or friction and shaft, worm and internal gear drive to the rear wheels or axle, and front drive and four-wheel drive, both positive mechanical and electric. We have had various gasoline-electric combinations. Many of these features are totally or practically obsolete today, such as the air-cooled engine, the horizontal engine, one, two and three-cylinder engines, friction and hydraulic transmission and combination gas-electric power plants. Worm drive began to come in about 1912 and by the end of 1915 the side chain drive was recognized as nearly obsolete. Internal gear drive in gasoline trucks is beginning to find acceptance and may become permanent.

The Knox Automobile Co., of Springfield, Mass., did more to create a market for gasoline trucks in the early days than any other company. Harry Knox was one of the pioneers of the automobile industry. In 1901 he fitted a light panel delivery body on one of his passenger car chassis. This was a three-wheeled affair, driven by a single-cylinder, air-cooled motor under the body and steered by a tiller. It was fitted with wire-spoke wheels and was listed at the modest retail price of $1000.

The Knox Company stuck to the air-cooled engine for about 10 years, but soon adopted four-wheels, then changed to a double-opposed engine as more power was required for its trucks, then moved the engine to the front of the chassis, added two more cylinders and set it upright, and finally adopted the water-cooling system. Eventually, it gave up

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the manufacture of trucks to devote its energies to the production of a three-wheeled tractor designed by Charles Martin and finally to its present four-wheeled tractor.

To the Vehicle Equipment Co., of New York and Brooklyn, belongs credit for developing the electric truck field most extensively. It began manufacturing in 1900, confining its attention almost exclusively to delivery wagons and heavy trucks up to five tons capacity. It was one of the first to abandon the use of reaches to maintain parallelism of the front and rear axles, using instead a set of four "pedestals" or steel guides riveted to the steel frame so that the axles could slide up and down in them but could not be forced backward. A large number of these machines were sold to leading industrial and commercial houses in New York and other eastern cities. They attracted much public atention because of their spectacular character. The Hall Safe Co. bought one in 1902 that was equipped with an electric winch for raising safes to the upper windows of sky-scraper office buildings. Big brewing companies bought them for delivering huge loads of beer in half barrels, a trunk company put one in service fitted with a special body built in imitation of a big trunk and a railroad timetable distributing company had one fitted with a body built to resemble a railroad coach. These and many others are still in use. In 1906 the Vehicle Equipment Co. passed into the control of the General Electric Co. and was reorganized under the name General Vehicle Co. It was the largest exclusive producer of electric commercial vehicles in recent years, but in 1915 entered the field of gasoline truck makers with trucks built under Daimler patents.

Light steam delivery wagons and passenger stages appeared in 1901. The Mobile Co. of America, of which John Brisben Walker, publisher of the *Cosmopolitan Magazine* at Irvington-on-Hudson, was president, started a steam bus line between New York City and Philips Manor, 28 miles up the east side of the Hudson River. The distance was covered in less than two hours, the busses accommodating eleven passengers each. The service did not last long, perhaps because of the unreliability of the machines and some doubt in the public mind due to the occasional catching fire of the busses.

In the same year the Locomobile Co. of America built a steam delivery wagon which was the first steam commercial vehicle to take part in a road competition in America. It was completed in Bridgeport on the afternoon of September 8, made the run the following day

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to Peekskill and took part in the hill-climbing test up Nelson Hill, which was included in the first endurance test held in the United States —the New York to Buffalo run organized by the Automobile Club of America. The hill was nearly half a mile long, with grades of 12 to 14 per cent. for 900 feet. The Locomobile wagon weighed 1700 pounds and carried a load of 700 to 800 pounds.

Another steam wagon built by the Baldwin Motor Wagon Co., of Providence, also made the ascent. It weighed 2240 pounds.

A year later the White Sewing Machine Co., of Cleveland, which carried the steam passenger car to its most successful development along original lines, entered two delivery wagons and three pleasure cars in the A. C. A. reliability run from New York to Boston and return—a distance of 488 miles. The run was held in October, 1902, and one of the wagons completed the run with a perfect score, qualifying for the president's cup and being awarded one of the 17 gold medals. Characteristics of the White Steamers that gave them superiority were flash-tube boilers into which water was injected in small quantities and converted into steam instantaneously just in the quantity required by the twin-cylinder engine; kerosene instead of gasoline burners; steam condenser which returned the exhaust steam to the boiler in the form of water; and also more substantial construction of the vehicle throughout.

Most of the early steamers had fire tube boilers in which the copper tubes were expanded at the ends in the heads of the boiler and were very subject to leakage of steam. They also used as fuel gasoline fed to the burner under air pressure, which was dangerous in case of a broken or leaking feed tube connection. However, at this period the steam carriage was in numerical superiority, prices ranging from $600 to $800.

Interest in passenger cars so greatly overshadowed the commercial car that the *Motor Review* was constrained to observe editorially with regard to the latter in commenting on the second New York show, held in December, 1901:

"It is evident that this important branch of automobile building has not received the attention which its commercial importance warrants and that progress has been less rapid than in other lines that are of less real utility."

At the second Chicago show, held the following February, out of 99 vehicles exhibited, only six were of commercial types, as follows:

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One Waverley electric delivery, one Milwaukee steam delivery wagon of 750 pounds capacity and another of 1800 pounds capacity, two Chicago Motor Vehicle Co. gasoline coaches of 18 and 22 passenger capacity, and one Chicago hotel bus.

Failure of the New England Vehicle Transportation Co. in Boston was recorded in the same month, its 90 electric cars and 30 delivery wagons being sold to the owners of *Financial News,* who planned to convert them into gasoline vehicles.

Ralph L. Morgan, a steam engineer, had six steam trucks of three, five and ten tons capacity under construction in Indianapolis. The Morgan Motor Co. was organized in Worcester, Mass., by his father and himself about the first of the year and in the spring the uncompleted machines and about 20 of the workmen were removed from Indianapolis to a new plant 100 by 100 feet that was erected in Worcester. This undertaking, like all others in the heavy steam field, soon failed. The cumbersome and complicated steam truck did not appeal to the American business world.

At this time and for a full decade afterward the European makers were considerably farther advanced in commercial vehicle engineering and production than their American contemporaries. The first French heavy vehicle trials were held in April, 1902, fourteen vehicles taking part in a 714-mile trial. These included six gasoline omnibuses, four gasoline trucks, two gasoline delivery wagons and one steam tractor.

The first American commercial vehicle contest was held one year later, in May, 1903. It was conducted by the Automobile Club of America and was confined to New York City, the routes being from the clubhouse at Fifth Avenue and Fifty-eighth Street north to Two Hundred and Thirtieth Street and back from the clubhouse south to the battery and return—20 miles and 10 miles respectively. The contestants were:

Make	*Power*	*Type*	*Weight empty, lbs.*	*Load, lbs.*
Knox	gasoline	delivery	2,070	1,245
Knox	gasoline	delivery	2,300	1,250
Blaisdell	gasoline	delivery	3,530	1,720
Union	gasoline	truck	4,525	2,710
Union	gasoline	truck	5,810	3,240
Waverley	electric	delivery	2,420	1,210
Mobile	steam	delivery	1,500	775
Morgan	steam	truck	11,160	5,740
Herschmann	steam	truck	10,225	3,805
Herschmann	steam	truck	14,500	10,000
Coulthard	steam	truck	14,225	10,000

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The announced object of the trials was to demonstrate that motor vehicles "can be successfully used in commerce at less cost and to greater advantage than the present horse-drawn vehicles." Ralph Morgan was the prime mover in inducing the club to hold the contest, which was not supported by the National Association of Automobile Manufacturers, whose directors believed that it was too early in the development of the industry to promote such a demonstration—a conviction borne out by the results.

Although most of the lighter vehicles came through without difficulties, the heavier machines made a poor showing. The Blaisdell broke an auxiliary hand pump and also caught fire the first day and withdrew. The Herschmann seven-ton truck developed a leaky boiler halfway of the first stage and did not finish the first day, but started again the second day and completed the stage. The bearings also heated. The Coulthard covered both stages, the first day in fair time, but broke a steam pipe the second day. The Morgan truck lacked power to climb Kingsbridge hill and had to back up, and broke a feed water pipe both days. One of the Union trucks lost a tire, swerved and upset on upper Broadway, and the other one developed overheated bearings, sheared off a radiator fastening, and finally withdrew with a bent crank-pin.

In June the N. A. A. M. executive committee instructed its technical committee, consisting of A. L. Riker, chairman; Rollin H. White, Charles E. Duryea, Otto Berg and H. W. Adler, to prepare plans for a future commercial vehicle contest.

A second test for service wagons was held by the club in April, 1904. This time the machines were placed in the service of the American Express Co., the Westcott Express Co. and Clausen & Sons Brewing Co. Awards for best performance were based on economy of operation, in time and fuel, ratio of dead weight to paying load, ton-mileage and general reliability and availability for service. The test covered six days, starting at Grand Central Station at 9 o'clock Monday morning, April 4. There were eighteen starters, including three Knox, two Olds, two Electric Vehicle Columbias, two Pope Waverleys, two Commercial Motor Co. steam wagons, and one each Rockliff gasoline, Union gasoline, Consolidated Motor Co. gasoline, Lansden electric, Cantono electric fore carriage and Fischer gas-electric combination truck.

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First prizes were awarded in six different load-carrying classifications from 1,000 pounds or less to 10,000 pounds, as follows:

Make	*Weight, lbs.*	*Load, lbs.*	*Miles.*	*Running Time*	*Deliveries*
Olds	1,225	500	228¼	28.59	282
Columbia	2,455	1,100	184⅞	25.20	260
Cantono	2,000	1,700	145⅛	23.42	187
Consolidated	3,450	2,500	239½	25.39	150
Union	6,850	4,000	172⅞	29.30	109
Electric Vehicle	6,700	5,000	150¼	24.27	127
Fischer	14,050	10,000	187½	33.44	76

Although the trials were declared to have demonstrated the success of the commercial vehicle, that it was shown it was quicker than horses, could make more deliveries or transfers in a day, cover more miles, was easier to handle in congested districts, was superior on long runs and occupied less space while loading, these were the last commercial vehicle competitions held officially, manufacturers being generally opposed to them.

Commercial vehicles have been a feature of most of the automobile parades held in the United States, beginning with the first, held in May, 1904, in New York City, by the Automobile Club of America. The business wagons made an unexpected showing in this event, the commercial division embracing 73 vehicles out of a total of 227 in the entire parade. There were representatives of nearly all types, from light gasoline delivery wagons to four and five-ton electric and gas-electric trucks entered by business houses. Electrics were most numerous.

Similar parades were held later the same month in Boston and Chicago, 50 commercial cars taking part in the Chicago event out of a total of 300 motor vehicles.

A noteworthy event that marked extraordinary early confidence in the practicability of the electric delivery vehicle was the opening of the new Saks & Co. department store in New York, with an exclusive automobile delivery service, consisting of ten Vehicle Equipment Co. wagons. This was the first big store to depend solely on motor delivery, and it never has used any other for its metropolitan service.

There was not much to mark the development of the industry from 1904 to 1906. The Packard Company, which had removed to Detroit from Warren, O., and changed its name from the Ohio Motor Car Co., brought out its first truck in March, 1904. This was built

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on the Model F passenger car chassis, and had a double opposed motor under the body, two-speed planetary transmission, center chain drive and channel iron frame. The following March the company exhibited a three-ton truck at the Boston show.

In the latter part of 1904 the Logan Construction Co., of Chillicothe, O., entered the field as an exclusive commercial vehicle manufacturing concern, and during the next five years put out enough gasoline trucks and stages to make considerable impression. Its machines were characterized by double-opposed motors hung under the body, sliding gear transmission, angle steel frames and wheel steer. The Knox Company also brought out a double-opposed model, air-cooled, with angle steel frame and planetary transmission, and the Cadillac Company offered a 400-pound delivery wagon on its first pleasure car chassis, having a single-cylinder horizontal motor and planetary gear, listed at $950. The Studebaker company offered an electric truck of 2,500 pounds capacity. In June, 1905, the Mitchell Motor Car Co. recognized the demand for commercial vehicles by announcing an open-bed 1,500-pound delivery car on its pleasure chassis, and in October the Reo Motor Car Co. had a 10-passenger bus with a double-opposed motor, and the Maxwell-Briscoe Motor Co. brought out a 3,000-pound truck with a double-opposed engine mounted across the front end of the chassis under a hood. The Premier Mfg. Co. also brought forth an open express wagon with air-cooled engine.

Horizontal single-cylinder and double-opposed motors were distinctively American products, and trucks having such motors, in conjunction with planetary transmissions and seats over the front axle became so common that for a period this construction was recognized as almost standard American practice, notwithstanding the example of European builders, who had brought the vertical engine forward under a hood and were using clash gears for speed changing. The Daimler Mfg. Co., of Steinway, Long Island, had obtained manufacturing rights under the Daimler patents and was producing this type of truck, in two and four-cylinder models, with channel iron frame, as early as 1902-3. But it took nearly ten years for American engineers finally to adopt it generally.

Almost by common consent there was recognition in 1906 that the production of commercial vehicles was developing into an industry. The *Commercial Vehicle* and *Power Wagon* were started in March

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as exclusive truck periodicals, and a little later were followed by another truck paper started by the publisher of *Automobile Topics*, which gave up the fight after a year or so. Commenting editorially, the *Commercial Vehicle* observed that the experimental period had practically passed and that the commercial vehicle was obtaining recognition; that it was passing through the stage that marked the transition from doubtful utility to a well-defined position as an economical factor and the logical successor of the horse. As yet it was too new and little known to have been generally accepted as a success. Construction was passing from the converted pleasure car to especially designed business vehicles. Failures of the gasoline motor had long militated against success, but this type of prime mover had now been brought to a high degree of reliability.

The stage of mechanical and commercial development which the commercial vehicle branch of the industry had reached at this period was recognized by the creation of a separate division for delivery wagons and trucks at the New York and Chicago national shows in January and February, 1906. They were grouped together in the basement of Madison Square Garden and in the First Regiment Armory in Chicago. The exhibits in New York included the following:

Packard three-ton truck designed solely for commercial purposes, having a reinforced wood frame and driven by a twin-cylinder vertical engine of 14 horsepower through a three-speed sliding gear and side chains to the rear wheels.

Four Knox trucks, of which the largest was a three-ton machine, having double-opposed, air-cooled motors, of 16-20 horsepower disposed under the body and planetary transmission.

Five Studebaker electric vehicles, including a 3½-ton truck driven by two motors through sprocket and chain to each rear wheel.

Six Vehicle Equipment Co. electrics from 1,000 pounds capacity to five tons.

Four Electric Vehicle Columbia vehicles, including a 1,000-pound delivery wagon, a one-ton express wagon and a three-ton truck.

Two Hewitt gasoline machines, one of which was a delivery wagon with a single cylinder, horizontal 10-horsepower motor, and the other a three-ton truck having a pressed steel frame and a vertical, four-cylinder, 25-horsepower engine driving through a planetary gear and side chains.

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Several Pope Waverley electrics, of which the largest was a three-ton truck with double motor drive through side chains, and the smallest an 800-pound delivery wagon, also with two motors.

Pope Mfg. Co. two-ton gasoline truck driven by a two-cylinder opposed engine of 20-24 horsepower, placed crosswise under the seat and transmitting through a magnetic clutch.

Olds one-ton wagon, having a pressed steel frame and driven by an opposed 16-horsepower engine.

Franklin one-ton truck with a wood frame and a vertical, four-cylinder, air-cooled engine of 12 horsepower.

Notable extension of the public use of commercial motor vehicles became evident in 1906. The Chicago Telephone Co. and the Chicago Edison Co. decided to abandon horse-drawn vehicles as rapidly as possible. The telephone company had then experimented with twelve different makes, and in May of that year ordered seven Mitchell delivery wagons and two Four-Wheel-Drive trucks. The Edison company, after four years' experimental use of five one-ton wagons, ordered eight electric wagons from the Automobile Maintenance Co. —now the Walker Vehicle Co. The distinguishing features of these, of which a large number are in use by the Commonwealth Edison Co. (formerly the Chicago Edison) and other purchasers, are the motor housed within the rear axle and the balanced gear drive through a pair of idle gears to an internal gear ring, all encased within disc wheels.

The first De Dion double-deck omnibus was put in operation in New York by the Fifth Avenue Coach Co.; the New York Transportation Co. was operating 616 public cabs and trucks, of which practically all were electric; the Anheuser-Busch Brewing Co. of St. Louis, believed to be the first user of motor wagons for the delivery of beer, was operating fifty electric vehicles, mostly five-ton Vehicle Equipment, Electric Vehicle, and Elwell-Parker products and a few gasoline trucks built by the American Motor Truck Co., of Lockport, N. Y.; Hartford put the first Knox hose wagon in service in her fire department; several companies were operating electric and gas-electric sight-seeing stages in New York City, seating from twelve to forty passengers each and making regular trips up Fifth Avenue and Riverside Drive to Grant's Tomb and special night trips through "Chinatown." Motor express services had been started in Detroit and

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Kansas City, the former with Olds delivery wagons and the latter with Logan and Lambert trucks.

About sixty motor trucks and delivery wagons were in use in Boston in this year, the early electrics having been succeeded by Knox, Packard, Olds and Rapid gasoline machines and by Waverley and Studebaker electric wagons.

The excellent work done in San Francisco at the time of the earthquake and fire on April 18 by Knox and Packard trucks, Cadillac and Oakland delivery wagons, and by White and other pleasure cars in Red Cross relief work created a sudden demand for commercial vehicles on the Pacific Coast. This demand has increased rapidly and steadily ever since, so that California now probably has more motor trucks in proportion to the population per square mile than any other state of the Union.

About twenty light electric delivery wagons and thirty heavy trucks, mostly electric were in use in Philadelphia. In the two years from 1904 to 1906, two dozen Vehicle Equipment trucks were sold in that city.

The Autocar Equipment Co. (now the Atterbury Motor Car Co.), organized in 1904, was building several models of gas trucks and electric vehicles. In 1906 it was marketing a three-ton truck with a 35-horsepower, four-cylinder vertical motor under the driver's seat.

The Rapid Motor Vehicle Co., of Pontiac (afterwards bought up by the General Motors Truck Co., together with the Reliance Motor Truck Co., of Detroit, which began operations in 1903) was building a line of 2,000 and 3,000-pound trucks and twelve to twenty passenger stages or sight-seeing cars. These had opposed horizontal engines under the body and planetary change speed gears.

The Four-Wheel-Drive Wagon Co., of Milwaukee (since removed to Clintonville, Wis.), which started in 1903, was running day and night with a force of sixty workmen at the end of 1906 and was increasing its capacity to 250 machines a year.

Commercial vehicles were grouped by themselves again in the Madison Square Garden show in December, 1906, and also in the Grand Central Palace show held by the American Motor Car Manufacturers' Association. In the basement of the Garden were exhibited Knox, Hewitt and Franklin gasoline trucks and wagons and General Vehicle (formerly Vehicle Equipment), Pope Motor Car Co. (Wav-

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erley) and Studebaker electric trucks and delivery wagons. Knox displayed a chemical fire wagon and Hewitt showed the first American heavy truck (five-ton capacity) having a pressed steel frame.

Heavy gasoline commercial cars were shown together on the gallery floor of Grand Central Palace by the Rapid Motor Vehicle Co., Logan Construction Co., American Motor Truck Co., American Machinery Mfg. Co. (Commerce trucks), Knox Motor Truck Co. (Atlas trucks) and the Auto Car Equipment Co. Electrics were shown by the Commercial Truck Co. of America, Lansden Co., and the Auto Car Equipment Co.

In the passenger car booths on the main floor were displayed delivery wagons by the Buckeye Mfg. Co., Maxwell-Briscoe Motor Co., Nordyke & Marmon Co., Reo Motor Car Co., Mitchell Motor Car Co., Oscar Lear Automobile Co. (Frayer-Miller truck), Eisenhuth Horseless Vehicle Co. and Torbensen Motor Car Co.

At the Chicago show the following February the commercial vehicles were mixed indiscriminately with the pleasure cars. There were only half a dozen makes on exhibition, all gasoline. However, the situation gave rise to a demand by the trade, voiced through the *Commercial Vehicle, Power Wagon* and other papers devoted to the industry, for a separate and exclusive commercial vehicle exhibition. The question was taken up by the N. A. A. M. and at the May meeting the directors decided to hold such a show the following winter in the Seventh Regiment Armory, Chicago, originally Tattersall's horse exhibition and sales building) simultaneously with the passenger car show in the Coliseum.

In the early fall of 1907 the Adams Express Co., which had used motor vehicles for a number of years, abandoned horse-delivery altogether in Indianapolis, relying upon eighteen General Vehicle electrics equipped with the long-heralded Edison nickel-iron batteries. Because of their excessive weight and rather short life, the lead batteries which had been in general use retarded the rapid extension of the use of electric vehicles. The lead battery makers, however, labored hard and energetically to improve their product and succeeded in reducing the weight and increasing the mileage per charge and the durability, which in turn enabled the vehicle makers to decrease the weight and otherwise improve the vehicles themselves.

Gasoline taxicabs made their first appearance in America in September, 1907. The New York Transportation Co. received delivery

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of the first lot of fifty Delahaye cabs ordered from Europe, and the New York Taxicab Co. landed thirty new Darracq landaulets. Its contracts called for 600 from France, to be delivered at the rate of 75 a month. This was the beginning of the taxicab movement that swept over the entire country within a period of two years, practically displacing the old-time hansom and brougham of the public liveries. Many leading liverymen in the large cities sold their horses and cabs and went into the motor taxicab business, while others were forced out of the public hack business.

A development that attracted no attention in America at the time but which had a marked influence on the industry seven years later, was the advent in London of Dennis motor omnibuses with worm drive instead of the customary side chains. This improvement grew out of the insistence of the London authorities for more quiet operation of the busses.

The first American concern to take up this innovation and make a success of it was the Pierce-Arrow Motor Car Co., whose first truck appeared in the winter of 1907-8. This experimental machine was a five-ton truck of the American type having the seat over the 50-horse-power, four-cylinder vertical engine and side chain drive. After extensive factory tests it was placed in trial service by the B. F. Goodrich Co. and performed remarkably well. However, the builders were not satisfied with it and before embarking in the manufacture of trucks commercially, redesigned the truck with worm drive but did not put it in the market until three or four years later.

The interest of municipal fire departments in motor driven apparatus developed remarkably from 1905 to 1907 and thereafter in increasing volume. At that time almost every northern city of consequence had either installed motor engines, hose carts, chemical engines or fire chiefs' wagons or else had the matter under consideration. Springfield, Hartford and Boston took the lead with Knox machines and America rapidly forged ahead of Europe in the adoption of motor fire apparatus. The Webb Motor Fire Engine Co. was one of the first to develop the gasoline pumping engine. It adapted the Thomas chassis to the purpose by mounting a water pump on the frame and connecting it by a gear and clutch with the transmission so that upon arriving at a fire the engine could be disconnected from the propeller shaft of the car and could drive the pump. Other companies gradually developed gasoline fire engines, including a number of the old, estab-

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lished steam fire engine manufacturers. A number of the passenger car companies fitted their chassis with special bodies and equipment to serve as combination chemical and hose carts, but it was not until several years later, about 1910 to 1912, that the truck manufacturers developed the heavier apparatus, such as ladder trucks and water towers on a successful commercial scale. At the present time the development along this line is largely in the direction of tractors or special power plants to which the apparatus built by fire engine companies can be attached. New York, Chicago and many other cities, both large and small, are installing motor apparatus rapidly, with the intention of eliminating horses from the fire department altogether.

The fire department of New York had the following motor apparatus in service at the beginning of 1915:

Gasoline steam fire engines	51
Gasoline pumping engines	2
Electric steam fire engine	1
Gasoline high-pressure hose wagons	24
Gasoline regulation hose wagons	8
Gasoline combination chemical and hose wagons	33
Gasoline fire boat tender	1
Gasoline hook and ladder trucks	39
Gas-electric hook and ladder trucks	4
Gasoline water towers	2
Gas-electric water towers	3
Motor delivery trucks	20
Automobiles, fire chiefs' and deputies'	39
Total	227

Contracts let and to be let during the year were expected to bring this total up to 342, and by 1917 the motorization of the department is expected to be complete.

A mile-stone in the progress of the American truck industry was set up when the first exclusive commercial vehicle show was held in Chicago in December, 1907. The whole of the huge Seventh Regiment Armory (Tattersall's) on Sixteenth Street, near State, was given over to this branch of the motor vehicle industry. The building was far from being all that could be desired, both in appearance and location, but the status of the industry was reflected in the exhibits of complete vehicles made by 20 manufacturers, as follows:

Rapid Motor Vehicle Co., Pontiac, Mich.—Ten styles Rapid gasoline machines, including sight-seeing cars for 12 to 20 passengers, a police patrol wagon, funeral director's wagon, hospital ambulance and

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several styles of trucks. Chassis showed opposed water-cooled engine placed lengthwise in the frame and driving through planetary transmission.

Studebaker Automobile Co., South Bend, Ind.—Seven styles electric wagons, including 800-pound laundry delivery, 16-passenger opera bus, 1000-pound chassis, 2500-pound express wagon and 4000-pound, 7000-pound and 10,000-pound stake trucks. Double motor drive through double reduction gears and side chains. Drop-forged axles. Forty-two cell underslung battery.

Couple-Gear Freight-Wheel Co., Grand Rapids, Mich.—Three styles electric vehicles in three chassis sizes, including five-ton stake truck, two-ton chassis and one-ton express wagon. Large models had four-wheel drive and four-wheel steer. Smaller type showed standard horse-drawn wagons coupled to electric fore-carriage. All motors carried inside wheels at right angles to axles with pinions on opposite ends of armature shaft engaging bevel-tooth rings on inside of wheel rim.

Reliance Motor Car Co., Detroit—Three gasoline machines, including a two-ton express with twin-cylinder water-cooled engine, a three-ton chassis with three-cylinder engine and a four-ton stake truck with four-cylinder engine, all of two-cycle type, vertical. (The Rapid and Reliance companies have since been merged in the General Motors Truck Co.)

Pittsburgh Motor Vehicle Co., Pittsburgh—Three electric vehicles, two of which were 750-pound closed delivery wagons and the other a 1500-pound delivery wagon. (This company started in 1905 and was succeeded by the Ward Motor Vehicle Co., which removed to New York about 1912 and effected an arrangement in 1915 with the Edison Battery Co., whereby the purchase price of the vehicle includes one year's rental of the battery which can be exchanged for a charged battery at any regularly appointed charging station.) The small machines exhibited were propelled by single Westinghouse motors driving by silent chain to the rear axle differential without any intermediate reduction. The larger vehicle had two motors suspended from the body and driving through a countershaft and side chains. The batteries were underslung.

Pope Motor Car Co., Indianapolis—Four Waverley electrics—a 1200-pound open express, a 1200-pound closed delivery, a one-ton covered express and a heavy truck. (The Indianapolis branch of the

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company was afterward taken over by the Waverley Motor Vehicle Co., which has continued the manufacture of electric delivery wagons and trucks to the present time.) The main features of these vehicles have already been described.

Knox Automobile Co., Springfield, Mass.—Displayed its new three-ton truck and 1½-ton express wagon, the former distinguished by four-cylinder, vertical, air-cooled engine under the driver's seat, and a three-speed sliding gear transmission.

Sayers & Scovill, Cincinnati—Exhibited for first time a 1½-ton chassis having armored wood frame, vertical four-cylinder, air-cooled engine under driver's seat.

Oscar Lear Automobile Co., Springfield, Ohio—Showed two Frayer-Miller 5000-pound trucks and a combination chemical engine and hose cart, all driven by four-cylinder, air-cooled engines cooled by a blower driven by the engine. They were further unique at that time in having four-speed selective transmissions. (The Oscar Lear company was eventually succeeded by the Kelly-Springfield Motor Truck Co. which brought out an entirely new line of water-cooled trucks in 1912.)

American Motor Truck Co., Lockport, N. Y.—One five-ton truck chassis to take any suitable type of body. Driven by a vertical, water-cooled, four-cylinder engine of 35-40 horsepower entirely enclosed in a compartment under the seat and footboards. Channel steel frame, two-speed planetary transmission and side chain drive.

Commercial Motor Truck Co., Plymouth, Ohio—One two-ton Plymouth chassis with friction drive of quadrilateral type and vertical, four-cylinder, 40-horsepower engine. Left side steering.

Lambert Motor Truck Co., Anderson, Ind.—One three-ton Lambert truck with friction drive, wood sills and vertical, four-cylinder engine. (This company was formerly the Buckeye Manufacturing Co.)

Mitchell Motor Car Co., Racine, Wis.—Two Mitchell 1½-ton delivery wagons, one of which had been driven from Chicago to New York with 3000-pound load in the preceding December. The chassis was a modified pleasure car chassis. (The Mitchell-Lewis Motor Car Co., successor of the original company, abandoned the commercial field.)

Alden Sampson Manufacturing Co., Pittsfield, Mass.—"Sampson" road train, consisting of six-wheeled tractor with 50-horsepower,

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four-cylinder, vertical engine under hood in front of seat, driving a direct current electric dynamo, and two trailers each electrically driven.

Brush Runabout Co., Detroit—"Brush" 500-pound delivery, one-cylinder vertical engine.

Coppock Motor Car Co., Marion, Ind.—"Coppock" gasoline truck with double-cylinder vertical engine.

H. H. Franklin Manufacturing Co., Syracuse, N. Y.—"Franklin" one-ton stake truck with air-cooled vertical engine under seat.

Logan Construction Co., Chillicothe, Ohio—"Logan" gasoline truck with opposed engine under body.

A. D. Meiselbach Motor Wagon Co., North Milwaukee, Wis.—"Meiselbach" gasoline truck, with friction drive.

Commercial Motor Car Co., New York City—"Safir" imported Swiss gasoline truck chassis possessing European characteristics of design.

Notwithstanding the good showing made by the industry, the very slight public attendance was decidedly disappointing and indicated plainly that the business world was not interested in such an exhibition at that stage in the development of commercial vehicles. As a result, the experiment was not repeated until four years later.

In the matter of mechanical development, it will be seen from the exhibits that constructors were still groping their way and were embodying in commercial vehicles nearly all of the various types of engines, transmissions, frames, and final drives that had been used in passenger cars and, in addition, a number of radical designs in electric and gasoline-electric commercial vehicles. Air-cooled engines and friction drive or transmission were prominent, yet the trend toward the vertical, four-cylinder engine mounted under the driver's seat, which later became the prevalent American type, was noticeable. The passing of the steam vehicle was marked as no machines of this class were shown. Frames were of channel steel, pressed steel and reinforced wood; engines of one, two, three and four cylinders, water-cooled and air-cooled, horizontal and vertical and two-cycle and four-cycle. Most of the axles were Timkens, as they are today. Wheels were generally wood, but there were a few steel disc wheels. Wheel steering predominated, yet lever steer was common on the electric wagons. Some of the machines were steered from the right and some from the left side, whereas today the great majority have left-side steer.

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Although the holding of exclusive truck shows was abandoned for several years after this initial effort, an opportunity to bring the industrial side of the industry to public notice was presented the following April by the motor carnival parade in New York, held by the A. C. A. to celebrate the tenth anniversary of the motor car in America. The illuminated night parade in which nearly 1000 vehicles took part was an innovation in the Metropolis and attracted many thousand spectators. There was an unexpectedly strong showing of 109 commercial vehicles in line, which traversed a 9-mile route up Broadway and Riverside Drive from Fifty-fourth Street and back. The New York Transportation Co. had the largest number of vehicles in the truck division, including a number of De Dion busses operated by the Fifth Avenue Coach Co., a string of Delahaye taxicabs and several electric vehicles. The largest number of trucks of one make was twenty Knox air-cooled machines entered by various business houses in the city. The next largest section comprised the electrics built by the Vehicle Equipment Co. and its successor, the General Vehicle Co. The New York *Herald* had eight different makes in line. There were several Hewitt six-ton gasoline coal, beer and merchandise trucks, and three new Alco trucks in the parade gave the first public evidence that the American Locomotive Co. had entered the field of heavy truck manufacture.

About this time the Packard company came into the market in earnest, with a new three-ton truck of European type having a four-cylinder engine under a hood forward of the driver's seat. It had a channel steel frame, 144-inch wheelbase, expanding clutch, magneto ignition, and right side steer and control.

In July the Baker Motor Vehicle Co. brought out its first commercial car, a 3000-pound delivery car model for the American Express Co. It was driven by a General Electric 3½-horsepower motor suspended from the forward end of the frame. The armature shaft was connected with the countershaft by silent chain and final drive was by side chains to the rear wheels. Total weight with battery was 3000 pounds.

The Autocar Co., of Ardmore, Pa., entered the commercial field in October, 1908, with a one-ton car fitted with stake or delivery bodies. It was probably the first shaft drive American truck. The engine, developing 18 horsepower, was of the opposed type.

In the period of 1909 to 1912 the development of the motor truck proceeded at a greatly accelerated rate. Many new manufacturers

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entered the field and the conservatism of the business world toward the introduction of motor transport began breaking down encouragingly. Big merchants and industrial companies began buying delivery wagons and trucks in fleets and lines of business that previously had not adopted them introduced them into their service.

At last the commercial vehicle began to give promise of a big future and this induced some of the leading passenger car manufacturing companies to enter the field in earnest.

The Packard company improved its truck model and went after the business in earnest. The White company, which had abandoned steam cars and was manufacturing gasoline passenger vehicles, gradually developed ambulances, police patrol wagons, stages and then light and heavy trucks. The Pierce-Arrow company after building several experimental trucks embarked in the business with a lot of 100 five-ton chain-drive trucks the first year and subsequently adopted worm-drive, being the first American concern to use this drive on trucks of this capacity. The Reo company brought out a one-ton truck, the Autocar company gave up the manufacture of passenger cars altogether and concentrated all of its energies on a single type of one-ton truck. The General Motors Company was formed and its subsidiary, the General Motors Truck Company, took over the manufacture of trucks in the plant of the old Rapid Motor Vehicle Co., in Pontiac, Mich., which had been bought up, together with the Reliance truck plant in Owosso. The Locomobile company, which had, like the White company quit the manufacture of steamers and was recognized as one of the leading gasoline passenger car manufacturing companies of the country, took up the manufacture of heavy trucks. The Peerless company and the Pope Manufacturing Co. also entered the field with heavy trucks.

Thus the engineering skill that had produced many of America's best gasoline pleasure cars was devoted to the commercial vehicle and there were ample facilities and capital behind their efforts to produce and market the new models in considerable quantities. The truck industry was able to profit by the experience that had been gained in the pleasure car field and a tendency toward standardization of design began to be apparent. The horizontal engine, and the twin cylinder and the air-cooled engine were generally abandoned in favor of the vertical four-cylinder engine located at the front of the chassis, the planetary transmission was replaced by the sliding gear type, pressed

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steel frames came into common use and magneto ignition became general. Although a good many pleasure car chassis were adapted to commercial work by reducing the gear ratio and fitting delivery and express bodies, there was an appreciation by the engineers that the severe duty demanded of motor trucks called for special design and construction throughout, and sturdier and more reliable trucks came into the market.

There have been and still are those who maintain that the requirements of the pleasure car and commercial vehicle are so radically different that a company cannot engage successfully in the production and marketing of both, but the success that has attended the dual activities of a number of the big pleasure car companies that took up the manufacture of trucks plainly refutes this belief. The solution of the engineering problems involved in the production of a successful touring car provide an excellent preparation for the solution of analogous problems in the design of a good truck.

During the period stated, when the vertical four-cylinder engine and sliding gear transmission were becoming standardized, the side-chain drive from a countershaft to rear wheel sprockets was practically universal practice. The drive from the transmission was by bevel pinion to the differential on the countershaft. But there were two distinct schools of design as regarded the position of the driver. One believed that the seat should be located above the engine, the advantages being that this permitted of a shorter wheelbase, which more evenly distributed the weight of the load on the front and rear axles, gave a shorter turning radius and elevated the driver to a height from which he could better observe traffic in congested streets. This design became known as the American type. The other school preferred the European type, with the seat located back of the engine and directly on the frame, as in touring car practice. This placed 70 to 85 per cent. of the weight of the load on the rear axle, which it was claimed gave better traction to the drive wheels and made steering easier.

Steam vehicles, both commercial and passenger, had practically disappeared from the market and the manufacturers of gasoline trucks and delivery wagons were making such headway that they far outdistanced the manufacturers of electric vehicles, so that the ratio of production was about ten to one.

Although heavy vehicle trials sometimes extending over periods of two or three weeks were being held annually in France, England and

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Germany, organized by the Automobile Club of France, the Automobile Club of Great Britain and Ireland and by the War Offices, neither the manufacturers' associations in this country nor the Automobile Club of America undertook to repeat their earlier attempts to conduct commercial vehicle competitions in the United States, and it became the settled policy of the American industry to discourage efforts to promote national undertakings of this sort. Evidently feeling, however, that the motor truck was in need of some publicity to be derived from public demonstrations of their capabilities and the haulage economies they could effect, prominent daily newspapers in Philadelphia, Chicago, San Francisco and several other large cities promoted and carried out one-day motor truck economy contests which were successful in so far as number of participants and economy of gasoline and lubricating oil consumption were concerned. Naturally they could not prove much as regards reliability or low maintenance, as these are matters requiring months of operation under actual service conditions to prove, which is the reason for the objection of the manufacturers to such trials. The manufacturers believe that the best evidence of the motor truck's qualities is their performance year in and year out in the service of prominent users.

The commercial vehicle trade journals were impatient to see the industry develop more rapidly, as were many of the manufacturers also, and kept up an insistent demand for the holding of exclusive commercial vehicle shows, so that finally, in January and February, 1911, the A.L.A.M. and the N.A.A.M staged one-week truck shows in New York and Chicago, respectively, immediately following the annual passenger car exhibitions in Madison Square Garden and the Coliseum. Both shows were well supported by the industry, 34 complete vehicle manufacturers completely filling the main floor of the Garden with excellent displays and 57 occupying the main floor of the Coliseum, while the galleries in both halls were entirely taken by more than 200 exhibitors of parts, accessories and supplies. Twenty-seven makers of complete vehicles exhibited at both shows, so that in all there were 64 different exhibitors at the two national shows that winter.

Notable among the makes of vehicles exhibited that are still prominently in the field were the Anderson electric, Autocar, Avery, Baker, Buick, Couple-Gear, Federal, Garford, General Vehicle, Kelly, Kissel, Knox, Jeffery, Mack, Mais, Packard, Peerless, Pierce-Arrow,

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Reo, Saurer, Sternberg (now Sterling), United States, Ward, Waverley and White.

The exhibits included a multiplicity of models for a great variety of purposes, from 500-pound light delivery wagons to motor fire apparatus, hearses, ambulances, taxicabs, dump trucks and even 10-ton coal trucks. Marked progress in construction was shown over the exhibits at the only previous exclusive truck show held in Chicago four years before.

Commercial vehicles were displayed at three national shows in January and February, 1912, the exclusive truck shows in Madison Square Garden and the Coliseum being repeated, while the N. A. A. M. held a combined truck and passenger car show in the New Grand Central Palace, New York. There were 36 commercial vehicle exhibitors at this show, the same number at the Garden show and 80 at the Chicago show—a total of 102 different makers represented at the three exhibitions, showing a substantial increase.

The truck shows were featured again in 1913, the A. L. A. M. show committee devoting the second week at both Madison Square Garden and Grand Central Palace exclusively to commercial vehicles and the N. A. A. M. doing the same at the Coliseum and First Regiment Armory in Chicago. There were 25 exhibitors in the Garden, 42 at the Palace and 77 at the Coliseum and Armory, making a total of 105 different makers represented at all three.

These exhibitions reflected the rapid growth of the industry at that period, for, besides the makes still in the market that were shown in 1911, the following makes were exhibited in 1913, many of them having been brought out during the two years: Atterbury, Bessemer, Blair, Bowling Green (Modern), Chase, Chicago Pneumatic (Little Giant), Commerce, Dart, Diamond T, Durant-Dort (Best), Four-Wheel Drive, Gramm, Gramm-Bernstein, Harwood-Barley (Indiana), Hupp, International Harvester (International), Koehler, Locomobile, Mogul, National, Old Reliable, Poyer (Menominee), Rowe, Sanford, Selden, Service, Standard, Stegeman, Stewart, Velie and Walker.

Extraordinary efforts were made to secure a good attendance of business men at all of these exhibitions during the three years by means of news and trade paper publicity and by thousands of special invitations accompanied by tickets of admission. Nevertheless, the attend-

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ance was far below the reasonable expectations of the exhibitors and the show management.

Local truck shows were held in 1912 and 1913 in Boston, Philadelphia, Pittsburgh, Cleveland and a number of other cities, with little if any greater relative success in the matter of attendance and sales.

Whether as a result of the public attention centered on the commercial vehicle through the agency of the shows or simply the natural growth of the movement, the industry nevertheless enjoyed a notable increase of sales during the years 1911, 1912 and 1913, but the apparent failure of the shows to produce direct results commensurate with the expenses incurred by the exhibitors resulted in the decision of the manufacturers not to repeat the shows another winter and no more have been held up to the present time.

An important outgrowth of the shows was the appointment of a standing commercial vehicle committee and commercial vehicle department by the N. A. A. M. in 1912 and these have been continued by the National Automobile Chamber of Commerce, successor of the N. A. A. M. and Automobile Board of Trade.

This committee called and conducted the first motor truck conventions ever held in America. The first was held March 4 and 5, 1912, and the second June 4, of the same year, at the headquarters of the association in New York. Both were open to all manufacturers of commercial vehicles and were attended by about 40 representatives of companies, including members and non-members. These conventions discussed and recommended a standard 90-day motor truck warranty, tables of standard speed ratings, body weight allowances, frame widths and lengths, demonstration charges, and standard form of caution plate against over-loading and over-speeding. These were afterward approved for general adoption by the executive committee of the association.

Seemingly apparent possibilities of great financial success in the motor truck field had for a number of years caused a continuous influx of newly organized companies for the manufacture of commercial vehicles. An average of not less than 50 new companies a year attempted to establish themselves in the industry and were not deterred by the exit of about 60 per cent. of them after relatively short periods of activity, dependent upon the amount of capital they were able to raise to conduct the experiment.

Every concern that entered the field found it decidedly more dif-

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ficult to cultivate than the passenger car field had been and the crop of sales of exceedingly slow growth. As a consequence, competition was very hard and in order to effect sales at all numerous unbusiness-like practices grew up which it was sought to correct in part by the standards recommended by the N. A. A. M. One of these was the giving of free demonstrations for periods varying from a day to a month or more. Another was absurd guarantees to keep the truck in running condition free of charge for a year or even "for life," guarantees of 50 per cent. overload capacity, and so forth.

Extravagant claims of salesmen in their efforts to capture sales from competitors led to serious abuses of trucks in the hands of purchasers, such as over-loading and over-speeding, so that it became necessary for the manufacturers, in self-protection, to frame a warranty and adopt other measures that would discourage such abuses of the machines. The larger users of trucks and delivery wagons gradually came to realize that they required regular inspection, adjustment and care like any other kind of machinery and that it was more satisfactory and economical to use them properly than to let them be abused by the drivers.

The manufacture and sale of commercial vehicles having developed into an industry of considerable importance by this time, with about 300 manufacturers and experimenters listed in the trade directories, of whom the great majority were, however, very small producers, the branch managers and dealers in New York organized the Motor Truck Club. This organization began to take an active part in local matters pertaining to its field and after two or three years undertook to broaden its scope to state and national affairs, with a membership embracing truck users. In October, 1914, it held a national convention of truck makers, dealers and users in Detroit which was attended by about 100 delegates. It also sought to have local truck clubs, that were organized in Philadelphia, Boston, Newark and Los Angeles, affiliate with it.

There was a reaction during 1913 and 1914 from the brief period of accelerated public interest and purchases that was evident during the preceding two or three years. It was due mainly to general business depression. With an annual production of only about 30,000 vehicles divided among about 300 manufacturers, none of the makers was making any money and they felt the need of getting together frequently to devise ways of improving the situation.

The National Automobile Chamber of Commerce therefore called

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another motor truck convention that was held in Detroit in May, 1915. This was attended by about 100 representatives of 40 companies and for two days many matters of importance to the industry were thoroughly discussed. One of these was the service to be rendered to truck owners by the manufacturers and their dealers and it was voted to have a standard form of service policy drawn up to be presented for adoption at a future meeting. The standard 90-day warranty of the N. A. C. C. was endorsed, and it was voted that the meeting did not favor the holding of truck shows the following winter.

An event that was wholly unexpected yet which has had more to do with the development of the motor vehicle and the industry than any other one event in its entire history, was the breaking out of the European war in July, 1914. Coming after a long period of depression in the trade, it looked for a time as if the war would only add to the troubles of the manufacturers. The financial situation throughout the world was seriously disturbed and ocean shipping almost ceased for two or three months, so that what small export trade had been developed was entirely cut off.

Then suddenly came rumors of big war orders about to be placed for motor trucks for use by the armies of the Allies and in the late summer these began to be confirmed by definite contracts for trucks by the hundreds placed with leading American manufacturers, such as the White, Packard, Peerless, Pierce-Arrow, Locomobile and other companies. These took orders to the limit of their capacity and representatives of the English and French Governments combed the market for other makes, and placed extensive orders for Kissel, Jeffery, Sterling, Four-Wheel-Drive, Morton Tractor, and various other makes.

The immediate effect of the orders was to clean up the market of all available stocks of completed trucks and parts and materials in the hands of the manufacturers and to start the factories working feverishly at full capacity.

The shipments brought large sums of new money into the industry and facilities for manufacture were increased. With the cleaning up of old models, many plants brought out new and improved designs, and within a year the standard drive of American trucks was almost completely changed from side chains to worm-drive to live rear axle. Left side steering became general and numerous other changes were made.

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The remarkable volume reached by the war orders is reflected in the official reports of exports issued by the U. S. Department of Commerce, which shows that exports of trucks to all countries increased from 50, valued at $106,400 in July, 1914, to 2,469, valued at $6,803,000 in the same month in 1915, and that they increased from 868, valued at $1,402,212, in the twelve months ended with September, 1914, to 20,062, valued at $55,688,427, in the twelve months ended with September, 1915. In the fiscal year ended June 30, 1915, England, France, Russia, Belgium and Italy received 13,244 American trucks valued at $37,499,000. France, which bought only two trucks the previous fiscal year, took 4990, worth 53 times as much as her purchases of pleasure cars in the same period. England bought trucks to double the value of pleasure cars and Russia to more than triple.

Commercial vehicles never had figured prominently in our exports before the war, but there was an amazing change directly due to that deplorable world catastrophe, as shown by the following export record:

EXPORTS OF MOTOR VEHICLES DURING NINE MONTHS ENDING WITH SEPTEMBER.

	1913		1914		1915	
	Number	*Value*	*Number*	*Value*	*Number*	*Value*
Commercial	778	$1,351,140	637	$1,066,545	17,269	$47,769,216
Passenger	20,175	19,950,718	19,530	17,209,964	31,036	26,793,972
Total	20,953	$21,301,858	20,167	$18,276,509	48,305	$74,563,188

MOTOR TRACTORS

The final elimination of the horse will result automatically from the perfection of the tractor. This important part of the automobile industry has been slower and less satisfactory in developing than either the car or truck. But it has made distinct and notable progress since 1913 and promises to reach a stage in 1916 that will give some indication of its real significance.

The car has eliminated, or is eliminating, the horse from use as motive power for personal carriage. The truck is assuming the field of freight haulage and business service, broadly.

That leaves the agricultural and military fields for the horse, and it will occupy the former on a decreasing scale for several years, according to the indications in 1916.

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Inexorably the course of progress lies in a different direction from the horse and in due course he must go. It will not be tomorrow or next year, but the signal for his leaving the stage of activity will be sounded by the exhaust of the perfected tractor suitable for service on farms of sixty acres or less.

There can be no reasonable question raised as to the utility of large tractors in sections of the country where fields are large and level. The Canadian wheat fields would still be virgin if the big tractor had proved to be a failure.

Now that machines can plow, harrow and seed an acre of ground in five minutes, the painful limitations of animal power in such service is apparent.

The tractor does the work infinitely faster, better and cheaper than can animals. Therefore, the agriculturalist who uses animal power is at a disadvantage when competing with his neighbor who has adopted machines.

It has been argued that the farmer will not take care of his tractors and so must be forever limited to the use of horses, which, of course, require much more care than the machines.

It may be true in some instances, but economic laws will deal harshly with such stupidity and elimination of such uneconomic factors in agricultural life will be swift and sure.

The argument is simply this: If tractors will do agricultural work cheaper, quicker and better than animals, the result must be larger yields and greater margins of profit for the user of tractors than for the user of horses.

The plain facts seem to be clear enough that ordinary, fairly intelligent use of tractors, is cheaper, better and quicker than animal power, in cases where the fields are large and level.

An important section of the automobile industry is extremely busy in 1916 in an effort to perfect the tractor for use on small farms. Ford, White, Avery, Morton and many of the truck manufacturers are working along that line and the prospects are flattering indeed.

The use of motor tractors in connection with farming, general hauling and for military purposes, is of much interest at this time.

One of the greatest fields for motor tractors is in connection with agriculture. A serious condition that has confronted the farmer is the shortage of help, as most of the young folks, at about the time they reach an age when they could assist on the farm, find it more desirable

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to take advantage of the many opportunities offered them in the cities. This condition is largely accounted for by reason of the fact, that farm work is done in about the same old-fashioned, laborious manner as has been the custom for many years, a condition that can be overcome very readily. Farm machinery can be motorized to a large extent, making the work more interesting, less laborious, and much less expensive. To do this, it is, of course, necessary to study carefully the many conditions that are to be encountered in agricultural work and meet them in the same manner that engineers have provided in every other branch of industry where high efficiency is required.

A tractor properly designed to successfully do agricultural work will also be suitable for almost any other line of work requiring an economical power.

The war has at least one purely constructive side, for it has taken or plans to take at least a million of the best draught animals and cavalry remounts from the American stock.

It will take four years to replace the animals. Long before that time limit has expired the automobile industry plans to have the tractor ready, so that the replacement need never be made.

What is to become of the horses?

It is hard to say. The alleged horselovers will probably drive many of them to death in an effort to make them keep up with the truck, car and tractor in the delivery of service. The war will eliminate many, and then the recent action of the Board of Health in New York in allowing "horse beef" to be displayed and sold in butchershops may be a significant indication of one other channel of use.

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CHAPTER XI

THE ROMANCE IN PROGRESS

EUGENICS!!

BEFORE the dawn of the automobile vogue one of the most serious problems that confronted the public generally, was the ever increasing difficulty experienced by farmers in persuading their boys to stay on the farms. The farmers also found some trouble in trying to keep their girls interested in farm life and from 1880 to 1890 conditions had reached such a stage that the yield per acre of the farm showed an average decrease in large areas of territory.

The situation was regarded as so serious as to call for radical measures. Force, coercion and finally improvement of farm conditions, were all tried without material result. Special educational courses were introduced more widely in the colleges to counteract the waste in men and methods that were undeniably average-practice on the farm.

It was quite the usual thing for the brightest and best son of the average farmer to abandon his home just as soon as he found means and strength to do so. This left the farm management in the hands of the less intelligent and less able sons. The girls did not flock to the cities to the same extent that was noted among the boys, but they longed to follow their brothers, because life on the farm was intolerably gray, flat and purposeless.

Better education of the rural boys and girls increased and emphasized the disadvantages of the farm and made the lot of those that stayed on the farm much harder to bear. In fact every effort that had been made to improve conditions worked out in quite the opposite way intended. Instead of tending to hold the most intelligent elements of the farm communities, they served to accelerate the stream composed of the best young men and girls to the cities. Between 1890 and 1900 there were numerous sections of the country, fertile and productive, or at least capable of being brought back to their original condition of productiveness, that showed the effects of this drain in net losses in population.

In some districts in New York this condition was notorious. In

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five of the New England states there were such localities. In sections of Iowa and Nebraska, the census figures proved that there was a distinct drift away from the farm. In Minnesota, Wisconsin, Michigan, Kentucky, Tennessee, the Carolinas and in fact in nearly every state in the Union there were spots, sometimes as large as counties, that lost population between 1890 and 1900. In New Jersey and Pennsylvania, in Florida and Georgia, the figures told the same story.

Where counties lose population during a 10-year period it shows that something very wrong exists in such counties. And as the losses noted were confined solely to the country and were not reflected in the census figures covering the cities, the conclusion is quite obvious.

The most important result, however, despite the fact that the opening of new land maintained the total yield of farm produce on an increasing scale throughout the period, was that the yield per acre in certain localities showed a progressive decrease.

Painstaking personal research, involving visits to a number of typical sections where the abandoned farm and the diminishing population were conditions and not theories, proved a number of interesting things to the satisfaction of the writer.

The fact had been noted in the Spanish-American War that the country troops compared unfavorably in stamina with city troops. Among the western regiments this condition was not so noticeable as it was in considering the eastern quotas or the regiments from the middle states. But it was generally present. The soldier from the city averaged better in the fierce test of military service, including the pestilent camp life, than the country lad.

The view may be held that this astonishing condition probably resulted from the long continued drain of the best blood from the farm to the city, but on the other hand, living conditions in the country, absence of general dissipation and the temptations of the city, would seem to argue for the production of stronger and more enduring men in the rural districts, other things being equal.

This is not borne out, however, by the figures nor in the experience of officers who were in a position to observe both country and city soldiers in service. The average country soldier was not as strong nor as enduring as the city man, despite the natural disadvantages of the latter.

Searching deeper than the surface for a reason for this condition brings to light some notable facts.

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In 1910 and 1911 extensive investigations were made, involving an examination of certain localities in New York, New England, Virginia, North Carolina and New Jersey.

These localities were all long settled. In several cases they had been farmed for 200 years. In one case the particular section had been occupied for more than 250 years and in the newest settlement the land had been in use for 140 years.

The places were all more or less isolated and difficult to reach by rail or boat transportation and almost, needless to say, boasted of no good roads.

In each of these sections, a net loss in population had been noted in the preceding decade and the average yield per acre of land was less than it had been in 1900.

The first outstanding fact that assailed the investigators was that everybody was related to everybody else. There were whole counties where it seemed as if a half dozen families represented a majority of the population. In certain townships, there were as many as 20 families bearing the same surname. The longer such sections had been settled, the worse was the general physical appearance of the land, to say nothing of the people. Good clothes and prosperity make a difference in looks, but the fact remains that the older such a community happened to be, the worse it looked.

The examination showed that the farmer boy on Saturday night, followed the immemorial custom of his kind, exactly as he did in better favored localities. When he had reached the proper age, he hitched up the old mare and went courting. Laboring under the handicap of poor roads, the mare probably made 5 miles at the utmost in two hours that have been established as the limit for such journeys. Manifestly the youth could not devote more time to the outward journey, unless he expected to remain overnight, because there are certain physical limitations for horse and man, particularly where the element of time is so important as it is on Saturday night in the country.

At any rate the investigation referred to showed that the farmer boys rarely attempted to drive a tired workhorse over the bad roads on courting expeditions more than 10 miles and that the average length of such drives was 5 miles.

Thus, if the youth lived in the center of one township, he rarely sought his mate beyond the limits of one of the adjoining townships.

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On the average, he selected her, or she him, as the case may be, from one of the nearer sections in one of the four contiguous townships.

This would be all very well in a community that had a vigorous and constant growth. One where new families, new faces and new blood were attracted by natural advantages. One where the best boys and girls remained to work the land. But in some of the sections referred to, quite the opposite conditions obtained. Indeed, so far as attracting new population, these localities suffered small but steady losses.

The farmer youth who went courting was a left over. He would not have been numbered as a resident, if he had had the intelligence and spirit of his brother or sister who had chosen to become a part of city life, or who had emigrated to new fields.

The girl he courted was at best of his own or associated blood lines.

Perhaps the mental processes of both young persons was of the subconscious order. Possibly it was instinctive or subjective. One of the fundamental principles of electricity is that like repels like. The positive poles of two magnets repel one another unless placed almost together. The blonde boy is attracted by the dark girl. The spare youth is drawn to the plump lady. Each seeks the complement of his own person, mind and qualities in the person of his mate. The bigger and more easy-going a happily married man may be, the sharper, more nervously active is likely to be his little wife. The large placid type of woman attracts small or medium sized men of quick temper, to make happy matches.

How often it is found that a big, assertive woman and a meek little man are perfectly happy together!

In communities where blood lines have been mingled for several generations there is small latitude for the young folks to seek and find their complements. Old Mother Nature is an imperious dame in this particular. So far, man, religion, teaching, and ethics have failed dismally to enact any laws, rules or systems that have proven efficient to change her course.

It always has been her whisper in the ear of the man or the girl, that has decided the momentous question of mating, providing the subsequent events proved the match to be happy. Any deviation from that course has meant and now means disaster for those most interested.

After viewing the characteristic features, habits of speech and physiognomy in a certain locality, noting the prevalence of type and

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temperament, one cannot but wonder, not that the community constantly lost its brightest and best young men and women, but that it retained anybody who could make a living elsewhere.

And then along came the automobile. Finally it reached even the remote spots. Good roads are part of the car and they soon followed. The farmer boy found that he could court the lady of his choice, even if she lived 50 miles away. He can select his mate from the whole wide world.

Perhaps the scientific agriculture that is being taught in the universities all over the land may have something to do with the increased interest that is being shown in the old farming communities, but it would seem as if the real reason for the markedly changed attitude of the university-instructed young farmer toward the farm might be found in his deep-bosomed mate, wooed and won through the automobile, singing over her housework and tending his growing brood of healthy children.

The following tabulation shows the census figures covering seven distinct localities that were settled more than a century ago and that lost population during the first decade of this century and have been gaining since 1910, the year automobiles began to be taken in quantities by the real farmers, and a few conclusions to be drawn from the figures:

State in which county or section is located	*Population in* 1900	*Population in* 1910	*Population in* 1914
Connecticut	2,716	2,643	2,890
New York (1)	1,645	1,420	1,566
New York (2)	3,786	3,754	3,918
Virginia	904	816	835
South Carolina	723	702	799
Massachusetts	1,854	1,635	1,803
New Jersey	301	298	314
Totals	11,929	11,268	12,125

Thus in seven scattered rural districts, located in six different states and separated from each other, in some instances, by as much as 200 miles, a certain condition common to all is found. They all lost population between 1900 and 1910 and they all gained population, reckoning from the figures of 1910, during the next four years. The figures of 1900 and those of 1910 are from the Federal census and those of 1914 are reports made by township and county officers, except in two cases.

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The figures show that a rural population of 11,929 in 1900 dwindled to 11,268 in 1910, a net loss of 5½ per cent., and then something happened and the same districts regained all their losses of 10 years and made a net gain from the 1910 figures of more than 1½ per cent. in the next 4 years.

The registration figures of students in higher agricultural courses in 26 institutions of learning in the United States in 1905 were 604.

In 1915 the agriculture classes of those institutions included 1734.

If that means anything it means that 1130 more of the most intelligent young men and women of the rural sections of the country, decided to remain on the farm and learn how to get more out of life, than there were in 1905 in those colleges.

There were eight automobiles registered in these districts in 1910, but in the fall of 1915 there were 146.

There are only two villages included in the territory covered.

The improved roads of the districts in 1910 measured 11¾ miles, while at the beginning of 1915 there were 28 miles of new macadam state road; 61 miles of dragged and graveled highway and most of the other traveled roads were smoothed and drained so that they compared favorably with the improved roads that existed in 1910.

It is not at all likely that the 146 automobiles now running in those seven districts, won enough brides to account for a net gain in population in the districts of 857 in four years. But they won some and they showed a lot of the young men that the thing can be done. The ones who learned the lesson are probably the fellows who since then have been prying into the secrets of agricultural chemistry, with the idea of converting their knowledge into wheat, corn, hogs and cattle in a better way than their fathers ever knew.

It has been said that the exhaust of an automobile motor "speaks all languages to a woman." If the woman be a 1916 country girl, whose mother and grandmother and female ancestors for centuries have suffered the intolerable isolation of farm life, as it was, it would not be surprising if the exhaust of her husband's automobile might sound to her like the "music of the Morning Stars," because it typifies to her the elimination of all those dreadful miles between the farm and the town; the farm and the city; her farm and other folks.

And so the automobile should be rated among the greatest of matchmakers, especially in the country. Its contribution to eugenics is to be found in the enriched blood lines of these impoverished districts. But

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what applies absolutely to such localities, applies with more or less force to all rural districts.

THE TRIP AROUND THE WORLD

The automobile industry always has had a full appreciation of publicity. It was the golden gain to be reaped in publicity that was the moving cause for nearly all the factory participation in racing and contests generally.

Since the industry started there have been literally thousands of "stunts" engineered with the single idea of gaining newspaper notice. There have been transcontinental trips in Reos, Packards, Wintons and others in the early days; there was a transcontinental trip by a dozen Premiers in a caravan, by Whites and many others at later dates; there have been sealed bonnet tests, low-gear tests by Franklin and high-gear tests by several others. There have been spectacular runs by the Regal Plugger, Abbott Bull-Dog and a list that would run into several pages if an attempt were made to chronicle them.

They all had a single purpose in view and they achieved it in greater or less measure, depending upon the time when the "stunt" was perpetrated and other conditions.

But the monumental "stunt" of all was the Race Around the World, which was scheduled to be run from New York to San Francisco, 4300 miles, then ship to Valdez, Alaska, where the cars were to run to Nome, 1200 miles. From Nome the cars were to be shipped to East Cape, Siberia, from which place they were to run across country to Petrograd and from thence through Berlin to Paris. This would have made a total land mileage of 11,350.

No automobile ever had made the little jaunt of 1200 miles from Valdez to Nome and there were no roads and hardly any trails. In the condition of the country at the time of the race, Alaska was about the most impossible touring field on earth. Anybody who had visited Alaska before that time would have been able to say with a wealth of detail that the trail between Valdez and Nome was impossible for automobiles, but it was left for one of the contesting crews to discover that fact, *after* their car had been shipped from the Pacific Coast city where it completed the first stage of the contest.

Thus the Alaska feature of the race had to be eliminated and

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through the addition of a long tour in Manchuria the land route was lengthened to 13,341 miles.

There were six starters, including the following:

Car	*Driver*	*Mechanic*	*Extra*
DeDion Bouton (French)	St. Chaffray	Hans Hansen	M. Autran
Moto Bloc (French)	Godard	Hue	Livier
Sizaire-Naudin (French)	A. Pons	Deschamps	Berthe
Zust (Italian)	Scarfoglio	Sartori	Haaga
Protos (German)	Lt. Koeppen	Hans Knape	Maas
Thomas (American)	George Schuster	George J. Miller	Montagu Roberts

The start was from Times Square, Forty-second Street and Broadway, New York, at 10 o'clock in the morning of February 12, 1908, and was witnessed by a quarter-million people.

The Thomas entry was approximately a stock car, 4 cylinders, rating at 60 horsepower. The others were all more or less within stock classification, but had more special work on them than the American car. In the dead of the Northern winter and with reports arriving of a severe season in the western mountains, the start was made with much eclat.

The Sizaire-Naudin had enough at Red Hook, New York; the Moto Bloc quit at Cedar Rapids, Iowa; the Protos took to the Oregon Railway and Navigation Company's equipment in place of its own power at Pocatello, Idaho, but the Thomas, Zust and De Dion-Bouton reached the Pacific Coast, with the Thomas covering the route in 42 days. This was 11 less than the Zust required and 14 less than the De Dion.

From San Francisco, the Thomas car was shipped to Valdez and after making a thorough inspection of 10 miles of the proposed route to Nome, Schuster decided that neither the Thomas nor any other car could make it. The car was shipped to Seattle, where it was learned that the other contestants had sailed for Vladivostok without waiting for the return of the Alaska party.

The American party took ship from Seattle and landed at Yokohama, Japan, and then toured 350 miles in that empire. From Japan the car was shipped to Vladivostok and from thence made the 8280 miles to Paris in 49 days running time. The car reached Paris July 30, making the final lap of the journey at 50 miles per hour.

The car made the distance in 170 days elapsed time, of which 88 days were spent on the road. The daily average run was 152 miles and the longest day's run was 420 miles.

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E. RALPH ESTEP
Pioneer developer of scientific automobile publicity.

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The Thomas covered 2385 miles on land in excess of the mileage of any of the other cars entered.

Considering the roads, season, weather and difficulties of making such a trip at that period of automobile development, the feat stands out as the most brilliant example of the publicity "stunt" ever carried through in the automobile industry.

The single fact that three automobiles were able to run from New York to San Francisco in winter under their own power and at high speed, everything considered, shed new light upon the sturdiness and power of the motor car and gave it a tremendous lot of publicity in the public prints.

The automobile, however, is not used by the average owner to perform "stunts" and the writer of this article can testify from experience during over 1000 miles of riding in the Thomas that made the New York to Paris race, that on poor roads a seat in the tonneau was insecure, uncomfortable and not a little tinged with danger, due to the extension of the body back of the rear axle to an excessive length. How the passengers managed to ride is a mystery when one thinks of the Siberian route.

THE AUTOMOBILE FROM THE RAILROAD VIEWPOINT

In the space of 12 years the automobile has grown from an unimportant position in relative rank as an element of railroad freight to first place among the list of commodities that take first-class rates, or better. The revenue accruing to the railroads each year from the shipment of completed automobiles is enormous and bids fair to keep on increasing. In 1914 the various railroads owned 75,000 so-called "automobile cars" and in round numbers hauled 140,000 carloads. In addition to this amount of traffic, fully 100,000 carloads of parts, raw material, etc., were shipped to the factories while fuel and other traffic items probably accounted for as many more carloads.

It is quite within the probabilities that the freight traffic of the automobile industry, including the material and fuel shipments to the factories of the accessory makers exceeds 500,000 carloads annually. The big item in the list is the freight shipment of completed automobiles, which at 110 per cent. of the first-class rate, in some territory

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and first class in the remainder, serves to produce rich revenue for the carriers.

The rapid growth of this branch of railroad traffic was a forced development. In 1905 when the Pierce-Arrow Motor Car Company wanted to ship a number of automobiles from its Buffalo plant there was not an "automobile car" to be had. The railroad companies had made small preparations to handle automobiles and the industry at first was obliged to depend upon the few freight cars that were used to transport horse-drawn carriages. These cars were equipped with end-doors and their use was open to numerous objections, particularly those of freight-handlers at important shipping and receiving points, who objected for one thing to the fact that the end-door cars required special placing at the freight platforms so that the automobiles could be unloaded without congesting the current of hand-trucks which ordinarily passes through several lines of freight cars on gangways that run through from one car to another standing on the adjacent track. Even when the carriage-cars were equipped with side-doors in addition to the end-doors, the difficulty of unloading a 15-foot automobile through an 8-foot door was a problem with too many engineering possibilities for the average freight-handler to solve.

Up to 1905 there was little appreciation on the part of the railroads of the possibilities presented by automobile traffic. There is something to be said in justification of at least a part of their slowness in catching step with the industry. The older rolling stock was built mostly of wood and an arbitrary widening of the doors to accommodate this new item of freight, it was feared, would weaken the structure of the cars. Therefore the roads entered an informal objection but agreed to build wider doors in a certain number of new cars. Despite this objection, a considerable number of old cars were remodeled to meet requirements and subsequent use of these cars has failed to uncover any fatal defect or weakness in their construction.

Another objection of the roads was that while the average car, with doors wide enough for automobile traffic, made an average of two trips a year carrying automobile freight, its main service to the road as a money earner lay in other directions.

For instance, in the season of grain shipping, all cars used in that field must be equipped with grain-doors, and in automobile cars the grain-doors had to be wider than in ordinary cars. Lumber costs money

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and the expense of making wider grain doors probably does amount to several cents per car more than the regulation size.

It was with the greatest difficulty that the automobile manufacturers persuaded the railroads to build cars with staggard doors to facilitate loading and unloading of long cars. The same objection was raised to the staggard-door construction as was made by the freight handlers concerning the old carriage-cars; namely, that it would be impossible to place plank bridges or gangways from one car to another. This objection failed, however, when it was shown that the extra width of the staggard doors was sufficient to allow the gangways to be laid in a straight line, precisely as before.

From the time the first cars were built with wide doors and staggard doors great difficulty has been found in having them available for the automobile trade when required. Such rolling stock is quite as useful for general railroad business as cars with narrow doors, in fact, the wide doors have been found to be available for other kinds of shipment to such an extent that the cry of freight congestion was frequently raised by the automobile manufacturing industry at and near the peak of its shipping seasons.

Probably the worst example of congestion was that of 1912, when the Cadillac Motor Car Company, of Detroit, was obliged to "store" several hundred thousand dollars worth of automobiles in the open air, or in other words, in vacant lots and streets near its plant because of a shortage of freight cars to carry the product to its agencies and branch houses. There were several other companies that were obliged to use open-air "storage" in 1912, but the protest of the Cadillac company was loudest and most far-reaching.

The problem of transportation by rail always has been insistent and the national organization of manufacturers appreciated that fact early in the development of the industry. April 15, 1905, the Association of Licensed Automobile Manufacturers installed a traffic department and placed James Sterling Marvin in charge of its administration. Marvin, a traffic expert of wide reputation, immediately, with the backing of the association, presented the requirements of the industry to the railroads, his first effort being to secure enough cars with wide doors. His department has aided the roads in numerous ways by giving information of present and future requirements and has received quite a measure of co-operation from the railroads.

While in the matter of rates and classification, the course of revision

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has been ever upward, there is no doubt that the trend would have been more pronounced without the services of the department. At a recent meeting of a freight classification body, the suggestion was made and seriously advanced to make the rate 125 per cent. of first-class. If such an advance had been put into effect it would have added at least $1,000,000 to the bill of the purchasers of automobiles in 1915.

There is no more justification for a rate of 110 per cent. of first-class on automobiles than there would be for that rate on carriages. Not so much in fact, because the carriages are more bulky in comparison with their weight than are automobiles. Yet carriages take the third-class rate, which in general terms is about 65 per cent. of first-class. Of course the automobile buying public pays the bills and its interests are so wide, owning as it does at least 80 per cent. of the wealth of the country and paying full 90 per cent. of the taxes, that it simply stands for the classification and lets it go at that.

For a great many years the railroads have carried rates on vehicles. When the automobile was first produced it naturally took the rates provided for vehicles. The first specific mention of automobiles in the freight classifications dated from January 21, 1900, when the following note was printed in the Official Freight Classification: "Vehicles, horseless, will be subject to the same classification as other vehicles of similar class, style and description." This note was carried in the classification four years, or until January 1, 1904, when a rating for "Self-Propelling Vehicles" was made separate and apart from the rating on other vehicles, resulting in application of first-class freight rates on automobiles in carloads, whereas the rating on non-self-propelling vehicles was continued at third-class. Automobile rates were thereby advanced 50 per cent.

On July 1, 1910, the rate on automobiles was further advanced to 110 per cent. of first-class freight rates. The minimum carload weight is 10,000 pounds for a 36-foot car, 11,200 pounds for a 40-foot car and 16,200 pounds for a 50-foot car; this refers to territory, generally speaking, east of the Mississippi River and north of the Ohio River.

In western states the rate is first-class and the minimum weights are the same except as to 50-foot cars on which the minimum is 14,200 pounds. In the southern states the rate is first-class, the minimum being 10,000 pounds on 36-foot cars, 12,500 pounds on 40-foot cars and 18,000 pounds on 50-foot cars.

From its inception the traffic department has acted as a sort of

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general freight department in which the transportation matters of the members of the association concentrate. There is not a meeting of railroad, rate-making or classification bodies which control the rates in any section of the country, with which this department is not at all times in touch. These meetings are attended by the manager of the department and information is furnished to enable intelligent consideration of the ratings properly applicable on finished automobiles and all their parts and accessories. Meetings are held and these matters are determined at various points, and the department has covered them and been represented from the Atlantic to the Pacific and as far south as Florida.

When it is considered that the industry has reached the point where, for the transportation of finished automobiles from the factories, the freight bill amounts to approximately $20,000,000 in the course of a year, the importance of seeing that the rates and classification are on an equitable basis may be realized.

The department also renders expert advice in transportation matters to members on inquiry and in a general way as occasion requires, and members have the privilege of also sending their receipted freight bills regularly to the department where they are checked against the legal published tariff rates and classification and if any overcharges exist they are collected and the amounts remitted in full.

The amount of freight paid by members for material and supplies and the expenditure in that direction, which is audited and checked by the traffic department, annually runs into hundreds of thousands of dollars for the National Automobile Chamber of Commerce and the Motor and Accessory Manufacturers. A similar service is performed by the traffic department for the latter organization.

Notwithstanding all that had been done in the way of building freight cars with door openings suitable for handling automobiles, the industry in 1912 was confronted with a very serious condition through lack of car supply, so that finished machines accumulated at the large producing points due to lack of shipping facilities. This was because the automobile cars were scattered throughout the country and not immediately returned to manufacturing territory.

It should be understood that in the handling and interchange of freight cars between the different railroads the rule is that the cars are, when made empty, returned empty or loaded to the owning road. This rule, however, does not always insure immediate return and in periods

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of car shortage particularly, the rule is not strictly observed, so that a railroad owning, for example, 5000 automobile cars, might have only a small proportion of such cars on its own rails. Notwithstanding the efforts made by the railroads serving the automobile factories to get this equipment returned with sufficient promptness and regularity to handle the output, a crisis occurred in 1912 which was a serious one for the manufacturers. At that time it was decided that the traffic department should undertake to assist in this particular and it immediately got into communication with every railroad in the country, explaining the conditions and the imperative necessity of all railroads locating any of this automobile equipment on the rails of the different railroads and getting it back into the manufacturing territory.

A tabulation was made of all of these cars by name and serial numbers and this was furnished to all railroads in the country to assist in locating the cars. A service was also immediately inaugurated whereby the factories, members of the association, furnished the traffic department with statements daily of the freight car numbers and initials containing their shipments and destinations, and from this information the department notifies the destination railroads daily of the automobile equipment on the way to them.

This information reaches the roads throughout the country in advance of the arrival of the cars and furnishes a further check on the misuse of this equipment when made empty, and has proved of great assistance in keeping automobile equipment more in the service of the automobile industry rather than using it for other purposes for which cars with ordinary doors are suitable.

THE SECOND-HAND CAR PROBLEM

The average automobile has three owners between the time it emerges from the factory, a shiny carriage driven by a comparatively noiseless engine, to the stage when it finds a resting place on the scrap-heap. The record shows at least one car that had as many as 18 owners, ranging all the way from its wealthy original purchaser, to its final owner, a dairyman who is still using it as a transfer wagon between his farm and the railroad station 4 miles away. This particular car has been in service for 7 years and delivers at least 16 miles a day, 7 days a week and 365 days a year.

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Up to 1911 it was a rule among the rich folk who took up the automobile early in its development to run a car only one season and then sell it or trade it in on the purchase of a new car. This was not necessarily because the car was not still able to deliver approximately its original amount of service, but because the improvements in detail were so numerous each year and the elegancies and luxuries added to each new model were so pronounced that it was quite easy for anybody of an observing turn of mind to tell the make and year of almost any car at sight.

The automobile at that period was only just emerging from its original crudities and a year made a material difference in the average run of cars.

The year 1911 has been reckoned a critical period for the automobile and it was then that the second-hand car problem appeared to be one of the gravest questions confronting it.

At that time it was the general practice for selling companies to bid in competition for the used car offered by the customer, so that the highest bidder might secure the order involving the sale of one of its new cars. As may be supposed, this led to some wierd price cutting on models current at that date and the practice is charged with the ruin of at least four manufacturing companies.

But the second-hand car problem dates back long before 1911. It was not a material factor in 1903 and was not a problem in 1904. But commencing with 1905 it began to occupy a prominent place. It was in 1903 that the imported cars began to be offered in trade by purchasers of previous years and the following year, which really marked the beginning of the American manufacturing industry as a real business, saw the trade established.

The American cars of 1904 were mostly in the classes that are now designated as medium and high-medium, with regard to list prices. They ranged from $1000 to $3000. Therefore the difficulties that beset the trade can be imagined, for instance, when the owner of a 1903 Mercedes which cost, say $16,500, decided that he wanted an American car listing at $3000 and offered his Mercedes in trade!

When the four-cylinder car came into general vogue there was a flood of single cylinder and two-cylinder cars dumped on the market and the companies that accepted such cars at substantial figures in order to dispose of their current product suffered huge losses. And when the six-cylinder type came along the experience was repeated

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with some modification, because the four-cylinder car is still rated as one of the standard forms of the automobile and naturally did not become obsolete in a breath.

In 1908 it was almost universal practice for retail distributers to accept cars of other makes as part payment for new cars. A very few of the manufacturing companies held to the rule of taking only their own old cars in trade. Only one concern maintained a basis of cash for cars and as that car was handled by agents in some sections of the country, it is by no means certain that many of its cars did not find their way into the hands of consumers via the trade route.

In that year the purely second-hand business loomed large. It had been founded shortly after the pioneer owners of automobiles began to suffer from "nerves" resulting from noisy gears, which was in 1903, and was generally conducted in conjunction with a bicycle repair and second-hand store. There were great opportunities for the alert dealer in those days, because noisy gears might worry one owner and not another, the cars were bought and sold "as is" and no guarantees were given or expected.

It is recorded that a second-hand car was sold to a dealer in New York in April, 1904, for $1600. Two days later the dealer sold it to a customer for $2600. The car was then used steadily for 7 months and was sold in the fall for $2200 and in the fall of 1905 came into the possession of the second-hand man at $1100. He resold it for $1600 the next spring without making any repairs whatever, except to straighten a bent mud-guard and touch up a few places where the paint had been knocked off.

In those days the extensive repair plants of the second-hand dealer had not been developed and the chief profit from the dealings were in the increases he was able to get over the prices he paid.

It has been a mystery to most of the automobile industry as to what becomes of the used cars. Careful investigation shows that the veterans of 1903-1906 did not have the durability of modern cars and that on the average they went to pieces after about 20,000 miles of service. There are some of the 1903 cars still running, but they represent a very minute proportion of the whole output of that year. Cars that antedate 1906 had very small second-hand value in 1915, even on a trading basis. As a broad general principle it may be said that the early cars have gone to their reward and are of no importance in the second-hand trade.

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Each year from 1906 to 1915 saw more and more quality built into the automobile and the quality was reflected in increased mileage of which the car was capable. The introduction of alloyed steel complicated the problem of the used-car dealer, because it had a tendency to prolong the life of the car, but in 1911, when the average automobile was built to deliver 40,000 miles, the cars of 1907, designed for 30,000 miles were still running in large numbers and the actual service difference betwen the old automobiles and those of the then current date was not very wide. The real difference was in the looks.

If the course of the industry had remained the same after 1911 as it had been before, the second-hand man would have been spared a lot of worry, but commencing with 1911 manufacturers who had been striving for several seasons to economize on the making of automobiles by introducing scientific methods of quantity production, began to reduce the list prices of their new product.

If a company made a model in 1910, for instance, listed at $1300 and announced that the price for its 1911 model would be $1100 for a car that had the benefit of a year's extra experience in making, the second-hand value of the 1910 model would be reduced at least $200 without a quiver.

To the owner who ran his 1910 car until 1912 and found that the newer model listed at $300 less than he paid and was a better looking and better acting automobile than his, it was quite a shock when the value of his 1910 car was estimated by the salesman. The way the plan worked was this: The salesman figured the cash value of the car, using in some cases the appearance and action of the car; its delivered mileage and the special conditions of the case to reach his figure and then arbitrarily deducted the $300 lopped off the factory list price.

Sometimes he used the second-hand prices that obtained for other makes of cars that had listed at $1300, but whose price level on the current year had not been reduced and then deducted the $300 from the estimate. But generally he offered as little as he thought the customer would take, irrespective of other considerations and the customer asked a little more than he thought the dealer would give. This led to some rather startling differences in the cost of certain cars in 1912 that were listed on an equal basis, for the exigencies of trade frequently brought extra supplies to one locality and created shortages in another which resulted in higher trading prices for old cars in one section and lower in the other.

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The adjustment of automobile prices to improved manufacturing conditions was a marked feature of every year since 1910 and as a consequence the used-car dealer has had to be very alert in order to avoid bad purchases.

The second-hand dealer aims to turn over his stock several times during a season. In the more progressive establishments of this kind the stock is cleared once a month and if the prices asked do not move the cars other prices are substituted, for the second-hand man has grasped the fact that there is nothing in the way of machinery that is so evanescent in price as the automobile, particularly the second-hand automobile.

There is an extraordinary difference between the value and the price of some second-hand cars. If a customer buys a car and takes delivery only to find that perhaps his wife does not like the appearance of the machine, or that it has not the type of body he really wanted and he tries to take it back and have the selling company buy it from him, he will learn something about depreciation in price without loss in service and value that will probably surprise him. A drive of 5 miles has been known to cut $1000 from the price of a car. And yet the car in its depreciated form was practically the equal of a car of identical model that had not been used at all.

In the summer of 1914, every company in the country that made it a practice to take in used cars in trade had a growing collection of old automobiles, ranging from picturesque ruins to serviceable automobiles that were unsalable. In some instances these collections represented a considerable amount of the manufacturing profit and the situation was distinctly disadvantageous.

Plans were advocated looking to the assembly of a large fund from the manufacturers with the idea of purchasing old automobiles; repairing the best of them and scrapping the rest. Some companies tried the expedient of refusing to deal except for cash, which, of course, had the effect of limiting the business of such companies, particularly where their competitors kept on taking in the old cars. It is a well known fact that the profits in manufacturing are in the last 25 per cent. of the schedule and while the first company probably had some new cars left over at the end of the season, the second, which took cars in trade, disposed of its whole schedule, but had a miscellaneous lot of automobile junk on hand instead of a substantial cash profit.

And then when the great war flared up and the jitney bus came into

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being, the whole problem was solved for the time being by the snapping up of every old car in the country that could be persuaded to run at all. While the supply lasted cars of 1907 found ready sale and for the first time since 1903 it may be said that there were no used cars to be had. This condition did not last long, but for a few weeks the whole country was stripped clean of old cars, thus converting certain items carried in the annual reports of the companies from "inventories" to "cash on hand."

Since 1914 there has been a tendency to profit by the lesson and it is not considered likely that the piling up of unsalable old cars will ever threaten the industry as it did prior to that time.

The standard companies, as a general rule, will accept their own cars in trade. Most of them will take other cars in part payment of new ones, and the prices allowed are steadier than they ever were before. Many of the companies have established special departments for rebuilding and repairing their own old cars taken in trade and when these are sold again, they go out with the guarantee of the company behind them. Sometimes the repair work and overhauling amount to 25 per cent. of the original list price of the car, but as a general thing it is closer to 10 per cent. The rebuilding departments turn out some very satisfactory automobiles but from their very nature they offer opportunities for "paper-profits" in the department accounts that are more apparent than real and so far have been subjected to careful scrutiny by the companies so that the error of other years in crediting unsalable junk taken in trade, in the inventory as an asset, may be avoided.

The pure and simple second-hand car trade can take care of itself. It is conducted by men who are shrewd buyers and optimistic sellers who will not pay too much or take too little and who believe in keeping their capital in a liquid state.

The typical history of a 1910 car can be written now because the average automobile of that date is finishing out its service. In April, 1910, for instance, the car was delivered in all its newness and smartness. The purchaser has paid $2250 for it and $250 for extra accessories. In that day the equipment of the car was not extensive and the extras were really necessaries. The car is driven 8000 miles during that first summer and early fall and is laid up for 90 days in the winter. When it is brought out in the spring, it does not look nearly so new and smart as it did when it was put away, particularly when it was

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compared with the cars of 1911. But the owner decides to retain it for another season and for the next nine months the car is given a severe trial. The average second-year mileage is usually greater than the first, because the little extra degree of care observed toward a new car has departed by the time the automobile is a year old and it is run under many conditions of road and weather that it would not have been called to do when new. In the fall of 1911 the mistress of the house is not proud to ride in the car and its fate is sealed.

The owner, if he has determined that the automobile is indispensable to his daily life, and almost without exception that is the verdict after a man has owned an automobile, takes it down to the place where he bought it and asks for a quotation.

Perhaps he has decided to purchase another car from the company, if the service of his present automobile has been satisfactory; or maybe he figures on buying an entirely different make. In the first case he is likely to get a higher bid for the old car than he would get elsewhere and unless his experience with the car has been unsatisfactory, the original dealer has a small advantage over the others.

Possibly he may be allowed $900 on the purchase of a $2000 car, although that figure is rather ideal. The company overhauls and repairs the car at a cost of from $50 to $200 and tries to sell it for enough to make the full list price of the second car sold. Sometimes they accomplish that feat.

The new owner is generally an individual who has owned a car before and who seeks to receive some allowance for an aged automobile of small original price. It is a curious fact that the relative value of a little old car is greater than of a big old car and as a general thing the second buyer secures the allowance. Bright and shiny in its new paint, the 1910 car goes into the service of its purchaser and perhaps delivers 20,000 miles in the next two years.

By that time the car has become obsolete, not from the fact that it will no longer run, because in most cases it still has many thousands of miles of satisfactory service to give, but in the meantime the development of automobile-making has progressed. It costs mightily to operate the old car. Fuel and tire consumption are high and the fact of the matter is the gears have grown a bit noisy. At any rate the owner decides to part with it.

He finds that in trade the value of his car is nominal and so the second-hand man gets the car in a considerable proportion of the cases.

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These contingencies arise where the automobile dealer offers, say $400 trade-in value and the buyer thinks he knows where he can get a car that will serve his purposes better than the new one offered by the dealer for, say $200, less money. The second dealer, however, does not want the old car at any price and the second-hand man offers $200 in cash. The buyer sells the old car for $200 and puts enough with it to get the new car of his choice and the second-hand man gives the old car a careful inspection and in some cases consigns it to the "out-of-town" trade.

When it has been proven to the second-hand man that the car is not available sales material as it stands, he sometimes has the body ripped off and a cheap wagon body installed and the car is then sold out in the country.

The buyer of such an automobile is usually a progressive farmer, dairyman or poultryman and the old car is put into commercial service. Sometimes the pneumatic tires are replaced by solids, but generally the tire equipment is continued. The car may do an average of from 20 to 30 miles daily, almost indefinitely, depending upon road, load and speed and when it finally goes to the scrap heap, the last owner will probably replace it with a freight automobile.

There have been tens of thousands of passenger cars converted into freight automobiles after passing through the hands and service of two or more owners that are now in use in the country districts. But of the million cars built prior to 1910 it is doubtful if 100,000 are still in service. They represented the development stage of the automobile industry and included the broad experimental work of the industry. The first million built since 1910 will average much longer in service and each succeeding million should show a considerable credit margin over its immediate predecessor.

While progress means much to the industry and to mankind generally, it certainly complicates the problem of the used-car merchant by forcing him to handle older and older cars that still contain potential service on a gradually lowering price scale.

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HOW THE SALESMAN DEVELOPED

Retail distribution of automobiles became an art with the growth of the industry. The changes that have taken place in methods of selling are quite as radical as those noted in the manufacturing end of the industry and in the character of the cars.

It requires an unusual combination of qualities to achieve much success in the field of selling, but the breadth and scope of the industry has afforded opportunity to develop quite a class of salesmen who have a right to be termed artists.

It is not very unusual in modern times for a first-rate salesman to dispose of cars worth $500,000 in the course of a year. The salesman who closes $50,000 of business in a year is rated as successful. The record for retail sales in one year is probably about $700,000. Such an amount of business means the combination of a high degree of energy, industry, diplomacy, enthusiasm, good looks, a good car and good luck.

The most successful automobile salesmen are fully matured men, mostly heads of families. They all bear a general resemblance, one of the main characteristics of which is their excellent poise of mind and body. They are all quietly confident that even if the particular cars handled by them are not absolutely the best in the world, at least they are the best for the money asked. Some of the best salesmen hold that the lines under their distribution are without peer, and when they are presenting their case there is a world of conviction conveyed to the customer by the earnestness of the salesman who firmly believes that his car is the best in the world, bar none and regardless of price.

The man who makes a success of selling automobiles ought to be of pleasant, clean-cut, physical appearance. Extreme youth is a handicap, and despite the fact that most of the best men engaged in the selling field are less than middle-aged, years and dignity are not a serious drawback.

The good salesman has a broad education although academic degrees are quite rare in his fraternity. He does business with men and women of wealth almost exclusively.

Wealth means power, and power is reflected and makes itself felt in a variety of individual ways. The automobile salesman must meet and adapt himself to the various expressions of power conveyed by the personality of his customer. He must be of sufficient mental caliber

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to influence the opinions and views of the customer, without seeming to do so. For instance, there is a kind of fundamental axiom of modern merchandising that: "The Customer Is Always Right." If the customer speaking from experience says that a certain hill is hard to "take on high," it is required of the salesman to agree, or perhaps add a little to the statement concerning the hill and then prove by the performance of his car that while the hill undoubtedly would prove difficult for some cars (without naming them), that his own demonstrator can do it with ease. Manifestly, it would be undiplomatic and offensive to a customer who holds certain well-founded opinions, backed in fact by his own personal experience, to make light of the hill, particularly in advance of the actual conquering of it.

Therefore, the artistic salesman has modified the axiom given above to read: "The Customer Thinks He Is Always Right and Has a Right To His Opinion."

There are numerous ways of making the opinions of the customer and the viewpoint of the salesman coincide, or at least harmonize, and as each case has some unique essential about it somewhere, the harmony must be the result of that mysterious quality termed the "Personal Equation," for want of a more definite designation.

Systems are excellent, but no salesmanager yet has devised any code that will serve to cover the problems of closing any sale beside the one under his attention at the time the code was framed.

In 1900 when the imported car represented a large share of the total business in this country the degree of salesmanship required was small. Most of the cars were sought and bought by the affirmative action of the customer, although there were some notable exceptions. The supply was small and the demand relatively great. The buyers, almost exclusively, were men of wealth who took up the new machine without much thought of its utility. It was something beyond the reach of the average citizen and contained certain sporting qualities that appealed to rich young men.

The best salesmen of that day were Europeans attached to the American branches and agencies and Americans who had graduated from the bicycle business. The first class was familiar with the construction of the imported cars, or was popularly supposed to be, and the bicycle contingent was widely versed in road uses and sports.

In 1901 the volume of importation and domestic production increased and while the original class of buyers was not perceptibly

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broadened, it was still sufficient to cause a smart demand for cars. Until the fall of the year, when there was a sharp financial convulsion that had a tendency to cause more or less conservatism, the selling of automobiles was not difficult. This money spasm brought forth a new class of automobile patrons, and every big break in the markets since that time has produced similar conditions. The "bear" operators in financial, commercial and economic lines of endeavor made much money. The new class of buyers included men who made fortunes, or what appeared to be fortunes in comparatively short spaces of time, ranging from 3 hours to 3 months.

Sometimes these successful "bear" operators paid substantial premiums over list prices to secure immediate deliveries and the salesman's task was not complex or difficult.

In 1902 and 1903 the American cars commenced to come on the market in some volume and then salesmanship began to develop in earnest. It has been termed the "Hooraw" period of the industry when a considerable amount of the selling was consummated to the cadence of popping corks and the signatures of some of the buyers straggled painfully across the bottom of the contract forms and would hardly pass the eye of the paying teller of a bank.

In 1904 another factor was added to the problem of marketing. Prior to that year the selling transactions were for cash as a general thing, but the rapid advance in engineering, design and mechanics rendered models a year old obsolete.

"Once a Motorist; Always a Motorist" has been a true saying from the beginning of the cult. Having owned a car, a person will do without almost anything rather than give up such ownership, but if he has the means he always wants to have the latest and best. When the paint cracked and faded, or the gears grew unbearably noisy, or any of the other signs of old age occurred a new car was indicated. But the old one would still run and was capable of delivering what passed then for fairly satisfactory service, providing one was not too fastidious. It was found that there was a market for such used cars and almost without attracting notice, the trading-in of second-hand cars was established.

Then the customer went shopping and the salesman did the buying. A more complete reversal of merchandising functions is not recorded in history. It called into being a new class of salesmen and added a bargaining element to the retail distribution of motor cars that exists

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to date. It became the duty of the salesman to buy the used car as low as possible to complete the sale of a new car and the customer soon learned the advantages of taking his wares to several markets with the idea of having several salesmen making competitive bids for his old car.

There was some lively cutting of prices at this stage of the business, for while the nominal list prices might be maintained, it was distinctly possible to meet a competitor and secure the order for a new car by allowing the customer more than the value of the old machine. There were some fancy prices paid for old cars occasionally in those days and the discriminating customer, even today, is not exactly without a competitive market.

The retail list value of the 1915 output of the American automobile factories was close to $600,000,000 and the salesmen who actually place that vast amount of merchandise in the hands of the consumer form an important part of the automobile fabric. They are now divided into three broad classes. First, the order-takers, who are men of moderate endowments and lacking in original initiative; second, bargainers, who have a highly developed sense of values, and, third, artists, who combine the ability to keep still; answer questions intelligently; close contracts; bargain to protect the interests of their employers and who can then step out into pioneer ground and actually sell.

The few who deserve this classification comply with the conditions outlined heretofore in this article and beside have an intimate knowledge of the car they are selling. They know it inside and out; what it will do; its limitations; its advantages; and they have the utmost faith and enthusiasm concerning it. Then, these men have the gift of expression. They are able to give voice to their knowledge, belief and enthusiasm so that the customer shall be attracted and impressed.

Technical familiarity is quite essential to success in selling, but there have been many lost sales because the salesman bored customers with technicalities, where such things were neither necessary nor understood. Disparaging the cars of competitors may make a sale now and then, but it has been found that it loses two for every one it makes and in addition has the effect of arousing suspicion in the minds of some customers so that he sometimes loses faith in all automobiles.

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THE ROMANCE OF GASOLINE

When Dr. N. A. Otto perfected the four-cycle motor, today the basis of the automobile industry, in 1876, he opened a new field for one of the most valuable petroleum products, that had been overlooked and avoided as a menace and danger prior to that date—the most volatile parts of crude petroleum.

Prior to its use in the gasoline engine and to a small extent in gasoline stoves, the lightest and most powerful portion of petroleum was either lost, deliberately in the processes of refinement or sold for a small price in a small market. Then the important part of petroleum was the white distillate usable as burning oil. The heavy hydro-carbon fluids constituting from 70 to 78 per cent. of the crude oil were designated by the term "refined oil," and found a ready market for illuminating and fuel. From 8 to 20 per cent. of the distillation was called naphtha and so cautious were both public and officialdom that special laws were made at various times to protect the public when it purchased "refined oil" from the chance of getting any naphtha mixed with it. Naphtha mixed with refined oil, furnished certain volatile elements that occasionally produced explosions. Hence, the laws prohibiting the refiner from allowing naphtha to remain in the refined oil and prohibiting the dealer under heavy penalty from selling the mixed product as refined oil.

As a consequence, "naphtha" was at a distinct discount and naphtha contains a considerable part of the commercial gasoline of modern times. Refined oil was in demand but naphtha was not.

Consequently, naphtha was allowed to escape from the stills without condensation to a considerable extent, because it was uneconomic to save it.

Prior to 1859 petroleum was mostly used as a pharmaceutical element. It had been discovered back in prehistoric times and was highly valued as a medicament. It was emulsified and also used as an embrocation for man and beast, but as fuel and light and power it was practically without use before 1859.

Early in the 50's the Rock Oil Company, a concern that really had produced some little petroleum for modern purposes as well as medicine, was engaged in digging an artesian well near Titusville, Pa., under the direction of Col. E. L. Drake and having encountered water and quicksand, the work was temporarily abandoned. But in 1859

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Col. Drake "cased" the hole by putting down an iron tube 39 feet long to bed-rock. When he inspected the tube the next morning he found it nearly full of petroleum and for a long time afterward this shallow well furnished about 25 barrels of oil per day.

That was the beginning of the petroleum industry.

Refining processes date back to 1855 and patents were taken out by Young and others for refining paraffin and other products from shale oil, but as a commercial factor there was nothing done until there was a commercial supply of the raw product.

In fact the chief commercial use for petroleum before 1865 was as medicine.

From an annual production of about 2,000,000 gallons in 1859 the petroleum production of the United States increased to 126,493,936 barrels in 1906 and since then has made vast strides, the production for 1915 reaching nearly 200,000,000 barrels.

The process of refinement in the early days produced the following results:

Products	*Per Cent*
Naphtha	8
Refined Oils	78
Residuum	9
Loss	5
Total	100

By superheating in the course of refinement the following results were secured:

Products	*Per Cent*
Naphtha	20
Refined Oils	70
Residuum	5
Loss	5
Total	100

The "cracking" process produced more of the volatile naphthas or gasolines and less of the refined oils than the early plan and left less of the heavy residual oil. The loss was about the same under both systems.

But in the course of progress it was found that about 25 per cent. of crude oil was available for use as automobile fuel and instead of getting the very light naphtha or at worst the whole cracked product included in the generic term "naphtha," the motorist in modern times

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gets a mixture containing some of the product that used to be designated as kerosene and the modern carbureter will handle it, providing the kerosene element is not too great.

Recently the Hampton carbureter has been perfected to handle straight kerosene and most of the great manufacturing companies are wrestling with the problem, several of them with promising results.

But in the meantime the bulk of the demand has been transferred from the refined oil of former days to the lighter and more volatile products of distillation and the price of the latter has advanced smartly while the price for the former, in the face of abundant supply has fallen, in a relative sense.

The world's supply of crude oil has a limit somewhere and those who have studied the problem of fuel supply with most care are divided as to where the limit will be found. It is unlikely that the supply of crude oil in the United States can be doubled over the current production and if that proves to be true, the situation involves importation or the use of more of the distillates of petroleum, providing the automobile industry is to progress in the measure now outlined.

The situation is so interesting that scientists, the highest class of them, are working to find some means of converting the lighter grades of kerosene and benzine into usable automobile fuel. Some are working on one line and some another, but progress is being made. As was mentioned in another part of this work, the addition of a small percentage of oxygen, in one of two or three forms, is being worked out on an elaborate scale and improvements in the carbureter are being designed steadily to make available a lower grade of fuel.

TRAFFIC REGULATION

The size of cities is limited, in inexorable economic law, by their transportation facilities.

The automobile extended the possibilities of size but added an element that today appears to aggravate the congested condition of city streets.

If it requires more than one hour for a worker to get from his home to his place of business the efficiency of the worker is affected. Therefore, if the worker can only travel at the rate of 2 miles per hour, the city can be only four miles in diameter; if 4 miles an hour, 8 miles in

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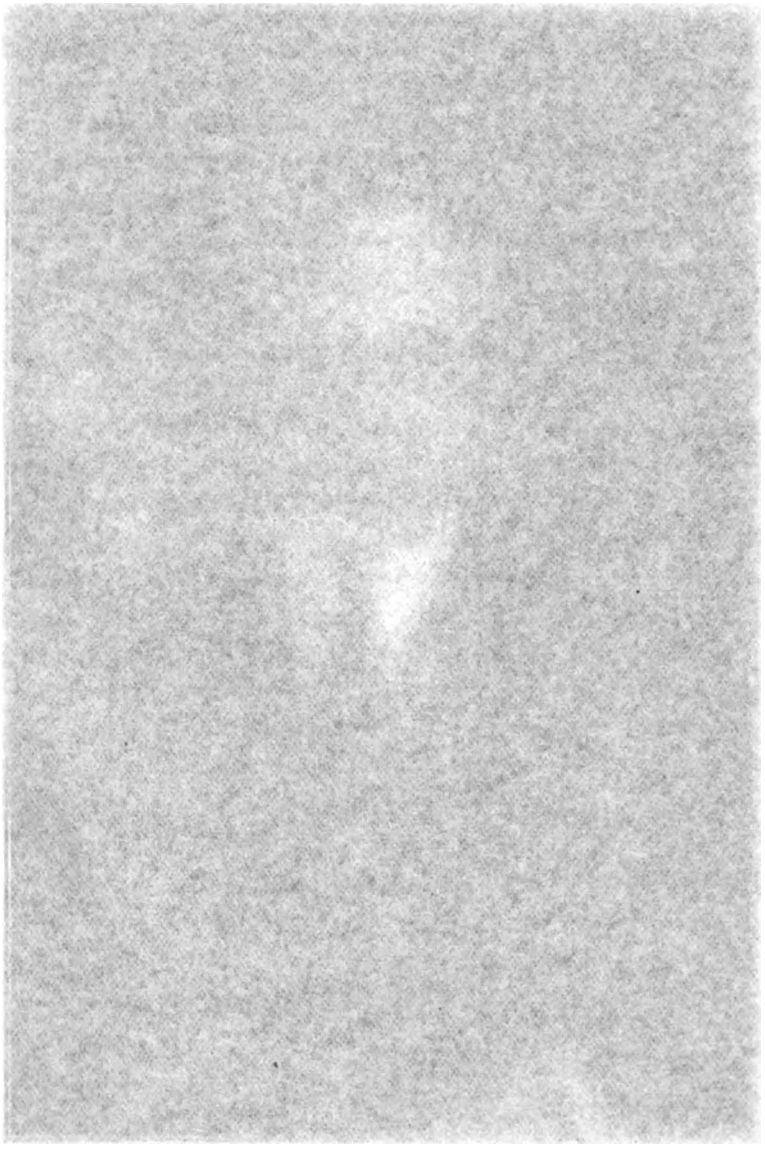

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WILLIAM PHELPS ENO
"Father of Traffic Regulations."

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diameter; if 20 miles an hour, 40 miles in diameter. Beyond the hour limit, it is uneconomic for the worker to live.

At the period before the birth of the automobile, congestion of traffic was such a serious problem in large cities that the possibilities of surface transportation on the streets were about exhausted. Street car transportation reached its limit and the elevated railroads were introduced to relieve the situation by supplying an element of extra speed to urban travel. Such improvements have only a limited field and the next step was to burrow under the earth and the subways grew. The final stage in subway development is now being completed in New York and when the limit of the carrying-capacity of all the existing means of city transit are exhausted, the growth of the city must be checked, unless some other factor of transportation enters into the solution of the problem.

As has been demonstrated during the vogue of the automobile, that factor is the motor car. It has served, not only to extend the available territory for the city worker to live in, but it has also been the means of increasing profitable traffic on all other lines of transportation.

To cite an illustrative case: A professional man, or one engaged in business can live 25 miles out of town and a half-dozen miles from the railroad station and still get to business within an hour. Before such a man would move away from the congested districts, he would have to be assured that he could remain in close touch with his town office. But when he did move, he left a place in town that would afford a resting and abiding place for another person and probably for many. The man in position to own a country home and a car, probably had large quarters in town and the very reason that led to his removing to a less crowded locality would in natural course result in the replacement of his town place by an apartment building suitable to house perhaps hundreds. Thus where the city would lose one resident, it would gain hundreds and everybody who occupied the site of the former resident's house, would furnish business for the transportation companies.

This process involving the removal of wealthy residents to outside homes and the replacement of the city houses by apartment buildings is strongly illustrated in every large city in the country, but particularly in New York. Manhattan Island is being given over to business houses and apartments. Very few private residences have been built in the county of New York in the past ten years, but there are certain

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sections of the borough where more people live in a single city square than in the majority of county-seats in the United States. The collective population of twelve selected city squares in New York contain more people than the average state capital in the United States, west of the Mississippi.

This condition has arisen through the encroachments of business on residential property and has been aided materially by the automobile. The condition is not found solely in the foreign quarters either. There are sections on Washington Heights where the congestion is almost as great as it is in some parts of the Ghetto.

Taking New York city as an example, although any other would do as well in a lesser degree, the congestion of street traffic is a serious problem. The teeming millions must go to and fro; must be clothed and fed; must work and play and sleep and die. In a word they each and every one have a part in making up the mass of traffic. One form of traffic is personal, involving the use of street transportation of various kinds. Another is vehicular, involving the use of the streets by vehicles. Both have limits.

When the automobile came along, vehicular traffic on some of the busiest streets in the metropolis was almost as heavy as it was possible for the streets to carry.

The first effect of the automobile in large numbers was to confuse the situation rendering traffic conditions chaotic. A column of moving vehicles can go no faster than the slowest unit and the automobile added nothing to the untangling of the problem, and in fact made it so acute that something had to be done.

William Phelps Eno among others grasped the significance of the situation at an early date and from a close study of local conditions, broadened by an intimate knowledge of the practice in use in the capitals of Europe, formulated a set of rules for the government and control of traffic that today is in force in whole or in part in most of the cities where there is a pressing traffic problem.

Eno, a man of great wealth in a material sense, but of vastly richer and more profoundly cultivated mind, gave 10 solid years of his life to the idea. Beyond the need of more money, he labored steadily and unselfishly for the good of humanity. He never made a dollar from his labors.

He has been called "The Father of Traffic Regulation" by those

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POLICE DEPARTMENT

CITY OF_____

STATE OF _____

_____CHIEF OF POLICE

REGULATIONS
FOR
STREET TRAFFIC

CORRECTED TO MARCH 20, 1916

COPIES MAY BE OBTAINED AT ANY POLICE STATION

READ CAREFULLY

DEFINITIONS.

(a) *The term "street" shall apply to that part of a public highway intended for vehicles.*

(b) *The term "one-way traffic" street shall apply to a street when and where vehicular traffic is restricted to one direction.*

(c) *The term "curb" shall apply to the boundaries of a street.*

(d) *The term "horse" shall apply to any draft animal or beast of burden.*

(e) *The term "vehicle" shall apply to a horse, and to any conveyance, except a baby carriage.*

(f) *The term "street car" shall apply to any conveyance confined to tracks.*

(g) *The term "driver" shall apply to the rider, driver or leader of a horse, to a person who pushes, draws, propels, operates, or who is in charge of a vehicle.*

(h) *The term "parked" shall apply to a waiting vehicle and to waiting vehicles drawn up alongside of one another not parallel to the curb.*

RESPECTIVE DUTIES OF DRIVERS AND PEDESTRIANS

(a) Streets are primarily intended for vehicles, but drivers must exercise all possible care not to injure pedestrians.

(b) Pedestrians should:—1st, Avoid interference with vehicular traffic and to this end not step from the sidewalk without first looking to see what is approaching;—2nd, Cross the street at a right angle, preferably at a crosswalk and, where a traffic policeman is stationed wait for his signal;—3rd, Stand on the sidewalk or close to the track when waiting for a car;—4th, Face the front of the car when alighting and observe the traffic on the right before moving to the sidewalk, and if passing behind the car observe the traffic in both directions.

(c) Pedestrians should keep to the right and not stop so as to obstruct a sidewalk or crosswalk or an entrance to a building.

(d) Pedestrians on streets with narrow sidewalks should use the sidewalk on their right.

The following regulations for vehicles shall be observed by the drivers thereof, who shall also comply at all times with any direction by voice, hand or whistle from any member of the Police Force as to starting, stopping, slowing, approaching or departing from any place, the manner of taking up or setting down passengers, and the loading or unloading of anything.

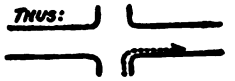
Police Officers may temporarily divert traffic to avoid congestion.

ARTICLE I. PASSING, TURNING, KEEPING TO THE RIGHT, BACKING, AND FOLLOWING.

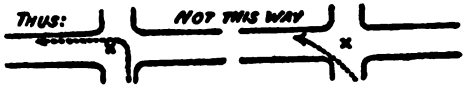
SECTION 1. A vehicle meeting another shall pass to the right.

SEC. 2. A vehicle overtaking another shall pass to the left and not pull over to the right until entirely clear of it; except in overtaking a street car when it shall pass to the right if space permits.

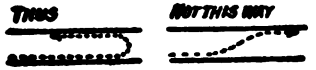
SEC. 3. A vehicle turning into a street to the right shall turn the corner as near the right-hand curb as practicable.



SEC. 4. A vehicle turning into a street to the left shall pass around the point of intersection of the two streets, *but if so directed by the traffic officer it shall pass in front of instead of around the point of intersection.*



SEC. 5. A vehicle turning from one side to the other of a street shall do so



SEC. 6. A vehicle shall keep as near as practicable to the right hand curb so as to leave the center of the street clear for overtaking traffic—*the slower the speed the nearer the curb.*

SEC. 7. A vehicle on a street divided longitudinally by a parkway, walk, sunkenway, viaduct, isle of safety, or cab stand, shall keep to the right of such division.

SEC. 8. A vehicle passing around a circle shall keep to the right from entrance to exit.

SEC. 9. A vehicle shall not back to make a turn if it obstruct traffic but go around the block or to a street wide and clear enough for the purpose.

SEC. 10. A vehicle shall not follow another too closely for safety.

ARTICLE II. STOPPING, STANDING, WAITING AND PARKING.

SECTION 1. A vehicle shall not stop with its left side to the curb except on a "one-way traffic" street.

SEC. 2. A vehicle waiting in front of an entrance to a building shall promptly give way to a vehicle arriving to take up or set down passengers.

SEC. 3. A vehicle shall not be left in such position as to prevent another from coming up to the curb in front of an entrance to a building, nor so as to prevent another already stopped at the curb from moving away, nor within ten feet of a fire hydrant.

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ARTICLE VI. SPEED.

SECTION 1. A vehicle shall not exceed the rate of speed established by law and shall proceed with great caution, especially in making turns, in crossing other streets and crosswalks and in passing other vehicles.

SEC. 2. A vehicle shall not cross a sidewalk to or from an alley, lot or building, except very slowly and with great caution.

ARTICLE VII. RESTRICTIONS IN REGARD TO VEHICLES.

SECTION 1. A vehicle's use is prohibited when so constructed, enclosed, equipped or loaded as to be dangerous, retard traffic, or prevent the driver from having a view sufficient for safety.

SEC. 2. A vehicle's use is prohibited when so loaded with iron or other material as to create loud noises while in transit.

SEC. 3. A vehicle when loaded with any material extending beyond its rear shall be provided with a red flag by day and a red light at night on the extreme rear end of such load.

SEC. 4. A vehicle unless confined to tracks shall not tow more than one other vehicle and the connection shall be not longer than sixteen feet.

SEC. 5. A motor vehicle left standing (without operator in charge) shall have its motor stopped and efficiently locked and its emergency brake set.

SEC. 6. No one less than sixteen years of age shall drive a vehicle intended for commercial purposes.

SEC. 7. No one shall ride upon the rear of a vehicle without the driver's consent nor with any part of his body protruding.

SEC. 8. Coasting is prohibited when dangerous.

SEC. 9. The use of a motor muffler cut-out is prohibited.

SEC. 10. Dense smoke from motors is prohibited.

ARTICLE VIII. CONTROL, TREATMENT AND CONDITION OF HORSES.

SECTION 1. A horse shall not be unbridled, nor left unattended in a street or unenclosed space without being securely fastened, unless harnessed to a vehicle with wheels so secured as to prevent its being dragged faster than a walk.

SEC. 2. A driver shall continuously hold the reins in his hands while riding, driving, or leading a horse.

SEC. 3. No one shall over-load, over-drive, over-ride, ill-treat or unnecessarily whip any horse.

SEC. 4. No one shall crack or so use a whip as to excite any horse other than that which he is using, or so as to annoy, interfere with or endanger any person.

SEC. 5. No one shall use a horse unless it is fit for its work, free from lameness or sores likely to cause pain, and from any vice or disease likely to cause accident, injury or infection.

SEC. 4. A vehicle shall not stand so as to prevent the free passage of other vehicles in both directions at the same time or in one direction in a "one-way traffic" street.

SEC. 5. A vehicle, except where parking is allowed, shall not stand at any angle backed up or head on to a curb, except while actually loading or unloading, and if horse-drawn and with four wheels the horses shall stand parallel with the curb, faced in the direction of traffic.

SEC. 6. A vehicle, unless a street car, shall not stop in any street except near the curb and then so as not to obstruct a crossing or cross-walk except to allow another vehicle or pedestrian to cross its path.

SEC. 7. A street car shall not stop within an intersection of streets nor within five feet of a street car ahead nor so as to obstruct a crosswalk.

ARTICLE III. OVERTAKING STREET CARS.

A vehicle overtaking a street car stopped to take up or set down passengers shall slow down, proceed with great caution and consideration and not approach or pass within five (5) feet of the step of the car while it is so stopped.

ARTICLE IV. RIGHT OF WAY.

SECTION 1. When in the performance of duty, the following vehicles shall have the right of way: U. S. Mail, Police, Fire, Fire Patrol, Bureau of Buildings, Emergency Repair of Public Service Corporations, Ambulances and the Military.

SEC. 2. Conditions warranting, North and South traffic shall have the right of way.

SEC. 3. A vehicle in front of a street car shall immediately turn out upon signal.

SEC. 4. A vehicle shall not so occupy any street as to obstruct traffic.

SEC. 5. A vehicle, on the approach of fire apparatus, shall stop so as to not interfere with its passage.

ARTICLE V. SIGNALS.

SECTION 1. A vehicle's driver when slowing or stopping shall give timely signal by hand or whip, or in some other unmistakable manner.

SEC. 2. A vehicle's driver when about to turn either from a standstill or while in motion, shall give timely signal by hand or whip or in some other unmistakable manner to indicate the direction of the turn. *This is especially important when turning to the left.*

SEC. 3. A vehicle before backing shall give ample warning.

SEC. 4. Police whistle signals shall indicate:

One blast—N. and S. traffic stops and E. and W. proceeds.
Two blasts—E. and W. traffic stops and N. and S. proceeds.
Three or more blasts } The approach of fire apparatus or other danger.

SEC. 5. A vehicle shall be equipped with lights and sound signals as prescribed by law.

SEC. 6. Sound signals are prohibited except for necessary warning.

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who have served with and under his direction to improve the methods of alleviating street congestion.

From the viewpoint of the automobile industry, Eno has been a powerful constructive force. It is quite palpable that if cars could not run in big cities, sales would be much smaller in volume and the industry would be hampered by the limitations imposed.

His system, known in Europe as the "Système Eno," now in force in nearly every capital city of the world, is simply shown in the accompanying diagrams and rules.

It has been estimated that under it, the volume of traffic can be, and often is, from three times to five times as heavy as it could possibly be without traffic rules.

The automobile industry is distinctly appreciative of Eno's broad service as it added immensely to the possibilities of the car.

THE SERVICE OF THE SPRING

When the motor car began to appear along toward the end of the last century, springs were used on carriages and some wagons, but were merely considered as cushions to relieve the shock of road bumps. Such vehicles moved so slowly that a broken spring could cause little or no damage. The material used was known as "spring steel," and "spring steel" was described as any steel that would "take a temper." Spring making at that time was an art, not a science, and the spring maker, a man endowed with some sort of magic art which he was loath to impart to others. To learn to be a spring maker meant long years of apprenticeship.

The increased speed of the motor car over the wagon immediately brought out the weakness in the springs then obtainable, as when the speed was doubled, the shocks became fourfold, and the old springs rode badly and broke easily. At about this time scientists began to evolve methods of improving the quality of steel by "heat treatment" and heat treatment proved to be the old spring makers magic, "tempering," except that the scientist transformed it from an art to a science. This marked the start of great progress in springs. Speeds began to increase at an alarming rate and the demand for better spring steels caused the steel makers to take notice. Where in the old carriage days the spring steel used had a strength capable of resisting a pull of

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100,000 pounds per square inch, we now have steel capable of 225,000 pounds of resistance. Research in the realm of heat treatment has taught how to greatly prolong the life of even an indifferent material.

As soon as motor cars began to show evidence of becoming reliable and popular, a demand sprung up for more comfort for the driver and passengers, and springs, since easy riding is almost wholly dependent on them, began to receive attention as to their length, width and flexibility. It was found that longer springs rode with more comfort, that greater range of action, or riding clearance permitted greater flexibility or softness and different modes of suspension came into use.

After these experiments and discoveries followed an era of great development, until today we have motor cars suspended on springs that ride equally well at speeds up to 60 miles an hour, with loads from one passenger up to seven and over roads ranging from our finest boulevards down to rough dirt country highways. Springs today outlast the other major parts of the car owing to the choice of steels and the knowledge of heat treatment.

The experience of all standard spring makers has been similar, but Christian Girl's service to the industry has some real elements of the dramatic. His company, the Perfection Spring Company, since its inception, has made only motor car springs, and for this reason is not hampered by the traditions of the old carriage industry. It has been a leader in the study of steels and their treatment as well as in the advancement of better suspension. Mr. Girl recognized from the start the necessity of building on the firm foundation of science, and as a result, the art and mystery of the early spring work has been replaced by definite scientific methods until at the plants of the Perfection Spring Company, steels are bought on analyses originating in the laboratory, the plates are forged, treated and shaped on the most modern machinery obtainable and all work is inspected and checked according to standards laid down by a laboratory equipped with the finest apparatus in the hands of men of brains and experience.

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THE WIRE WHEEL IN AMERICA

Many early automobiles were equipped with wire wheels adapted from bicycle practice, and these wheels proved unsatisfactory in service and were abandoned. The modern manufacture in this country of wire wheels for automobiles began in a small way in an Eastern city in 1912. Complicated manufacturing schedules due to the necessity of furnishing inner hubs of types necessary to fit axles and bearings of a very large number of various makes of axles, all different radically in construction, resulted gradually in a great majority of the original concerns dropping from the field. That such development would be for the general good of the wire wheel industry, is quite conceivable because of the rather freaky construction advocated by several of the manufacturers.

During this period a Rudge-Whitworth wire wheel designed and built in England was brought to this country and introduced by George W. Houk, thus making Houk one of the pioneers of the wire wheel business on this side of the water.

Prior to the advent of Houk, neither the public owning motor cars nor the manufacturers of motor cars had evinced much interest in the subject of wire wheels. A few sets had been sold by the McCue Company of Buffalo, the Metal Products Company of Detroit, the Ellsworth-Cross Company of Chicago and the Dunlop Company of Long Island, but so insufficient was the volume of business of these concerns that all have, at this date, retired from the field.

A factory was secured and from the start a successful and accepted wire wheel produced. There are now (1915) being completed and shipped daily over one thousand wheels with the component parts.

Very few can appreciate today the great strides made by the steel wire manufacturer, the steel rim maker and the wire wheel manufacturer in the perfection of all details in order to make possible a heretofore unheard-of guarantee of three years upon a mechanical unit, which guarantee is unconditional.

While the wire wheel for motor cars has been made abroad for a number of years, it remained for the American manufacturer to design and perfect not only a more adaptable wheel but one that was stronger and yet less costly to make in quantities and thus permit its usage to extend to every motorist. There was a time when the manufacturers

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in this country looked abroad for the finest products of steel. It is not true today.

This is the great "Safety First" age. The remarkable progress made by all great concerns in the improvement of every device calculated to preserve and safeguard human life is constantly before us in the daily press, in magazines and in slogans and signs on every hand.

Today no improvement can be termed successful unless it embraces this important feature. That the wire wheel does so is markedly evident from an explanation of its construction and a comparison with the wood wheel.

The component parts of a wire wheel consist of:

(a) Steel rim.

(b) Steel hub shell.

(c) From 60 to 72 steel spokes and nipples (the exact number depending upon the size of the wheel).

(d) Steel inner hub with drive studs (replacing the wood wheel hub).

(e) Hub cap containing an automatic locking device.

Spokes are laced to hub shell and rim in such a manner that they cross one another at the proper angle to take and absorb all stresses and strains to which the wheel may be subjected under any circumstances. The lacing is accomplished by automatic machinery which places each spoke in the required tension. It will be noted that under this construction the wire wheel becomes what is known as a suspension wheel, because it supports its load in the same manner as is undertaken by a suspension bridge.

The method of lacing and the angle of spokes in a wire wheel constitute important features because therein lies its great strength in resistance of lateral or skidding stresses. Those motorists with cars equipped with wood wheels who have been unfortunate enough to skid even lightly against a curb stone or other immovable object, have had occasion to observe the absence of even the slightest resistance of such a shock by the wood wheel. A blow three times as severe as could be borne by a wood wheel would not affect even the trueness of a wire one and consequently this advantage relieves the car owner from frequent expensive damage and delay.

It was determined by an American manufacturer of wire wheels that the design of his wheel should be such as would permit an easy, simple and yet perfectly safe change of wheel and tire in case of puncture by removal of the wheel with damaged tire and replacement

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GEORGE W. HOUK

President Houk Manufacturing Company. An important factor in the reintroduction of wire wheels.

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of a spare or fifth wheel. This plan was so successfully carried out that a complete change of wheels has been accomplished in fourteen seconds from the time the car stopped until it was under way again.

Furthermore, it was incumbent upon the American manufacturer to produce not only a wheel superior in strength to the foreign builder's product, because of the roughness of roads in this country as compared to those of Europe, but also a wheel whose beauty and grace of design would appeal to the most fastidious motor car owner. It is universally admitted a successful combination of these features has been accomplished.

One direction of the economy of a wire wheel lies in its ability to preserve the life of tires, which is accomplished by the fact that its metal spokes and rim radiate the heat generated in the tire by friction of road and tube plus the heat of the surrounding atmosphere. The conduction of heat is, of course, greatly increased by reason of the wheel revolving.

One of the largest and fairest tests of the increase of tire mileage by the use of wire wheels was made in London some two years ago. One hundred vehicles of the same type and weight were selected and fifty of these equipped with wire wheels. After a period, during which the cars with wire wheels operated a distance of 172,731 miles, and those with wood wheels 102,524 miles, a computation was made. The wire wheel equipped cars did 3,454 miles each and the wood wheel equipped 2050 miles each, an increase of tire mileage for the wire wheels of over 68 per cent. This represents 4 cents per mile reduction in tire expense.

A wire wheel when manufactured is both laterally and circumferentially true and it remains so, hence the absence of cross-grinding of tires. By the elimination of this particular tire wear, as well as heat, the tire has only to contend with friction due to the perfectly revolving wheel and this is fully compensated for by the tire manufacturer in the construction of tires.

In weight distribution the wire wheel has been adequately designed, the major portion being at the hub where the greatest strength is needed. That this should be so needs no comment from those who have given the subject consideration and as all unnecessary weight has been removed from the rim, a balance is secured impossible to bring about in the wood wheel.

A well balanced wheel not only means the car will follow the road

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more closely but will not be subject to the small shocks of depressions or irregularities of roads and renders the car more quickly stopped than started.

SOME STATISTICS

The fiscal year ending June 30, 1915, was by far the greatest noted up to that date in the automobile industry. The American factories turned out 703,500 motor cars during the year and sold them all. The factories could have sold more if they had manufactured more, but owing to a curious psychological factor, the automobile industry was misled at the outbreak of the European war by a series of influential articles published editorially urging the companies to pursue a policy of caution.

It cost the factories a lot of business that they might have had, if they had been in position to supply the cars. Four large companies missed business of at least 20,000 cars because they could not make deliveries, and only a few were able to keep anywhere near their orders.

In the 1915 manufacturing season, about 200,000 more cars were built than in the preceding year, but there was a market for at least 100,000 in addition that could not be supplied.

The sale price of the 1915 output was $625,000,000, and the average price of the passenger automobiles sold was $811.

Deliveries on an unprecedented scale were made in May and June, amounting to not less than 200,000 cars, few of which got into the registration totals, but on July 1, the number of registered cars was given, after making all deductions for duplicate registration in more than one state, as 2,070,900. This figure was increased to about 2,500,000 by the end of the calendar year and when the last of the 1916 schedule finds registration by the customers who buy the cars, the total will be not far from 3,500,000.

The following statistics, some of which represent official figures, will give an idea of the industry as it stood at the end of the fiscal year of 1915 with some subsequent data and revisions:

Registered in New York State at end of September, 1915	222,000
Registered in California at end of October, 1915	160,000
Registered in leading 10 grain states	677,000
Motor vehicle fees collected in 27 out of 49 states	$13,259,000
Passenger car manufacturers	236
Commercial vehicle manufacturers	257

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Total manufacturers of passenger and commercial cars	448
States in which automobile factories are located	34
Proportion motor vehicles to population of U. S. (1916)	1 to 30
Proportion of motor vehicles to miles of road, more than	1 to 1
Total value motor vehicles exported during 12 months ended September, 1915	$85,794,143
Increase over previous 12 months, per cent	257
Value exports of commercial vehicles during 12 months ended September, 1915	$56,688,427
Increase over previous 12 months, per cent	3943
Value exports passenger cars during 12 months ended September, 1915	$29,105,716
Increase over previous 12 months, per cent	29
Freight car loads automobiles shipped during first 10 months of 1915	142,983
Miles traveled annually by motor vehicles (1915)	20,000,000,000
Gasoline consumed annually by automobiles (1915), barrels	13,000,000
Lubricating oil consumed annually (1915), gallons	20,000,000
Tires used annually on motor cars (1915)	16,000,000
Wage earners employed by 60 Michigan automobile factories	51,000

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CHAPTER XII

THE MISSION OF THE AUTOMOBILE

HENRY M. LELAND, past president of the Society of Automobile Engineers and head of the Cadillac Motor Car Company, delivered the prophetic statement before the S. A. E. that, in his opinion, 30,000,000 people in America should have automobiles. Leland never meant that the American people afforded a market present or to come for 30,000,000 Cadillacs, all in existence at one time, or even that number of Buicks, Overlands, Maxwells, Studebakers or Fords.

Even on the basis of a $400-car the initial cost would be prohibitive and the operation and maintenance total, altogether too large. He had in mind either one of two things. First, and most likely, when he said that 30 million Americans should have automobiles, he probably figured five persons to each car, which would reduce the number of cars to 6,000,000. On that basis, the estimate of Leland appears rather conservative, but it should be remembered that it was made when the total number of automobiles in existence was considerably under 2,000,000.

The second possibility is that Leland had in mind a type of automobile that would approximate in first cost and maintenance a single-horse buggy, but capable of giving anywhere from three to ten times the amount of service at a small operating cost.

Undoubtedly when the increased use of motor cars has forced the extension of good roads the demand for automobiles will increase until everybody who can buy one will own a car. Just how wide the present financial field may be is a question that is enveloped in more or less haze at the automobile factories.

One concern figures that the potential buyer of the automobile begins with the person who has an income of $1800. Another reckons that the person whose income is $3000 is a fit "prospect" for its salesmen.

A series of careful canvasses among automobile owners, conducted with as much painstaking detail as was possible in the premises, showed

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that the average owner of a single $500-car enjoyed an income of $4115 annually. The use of the car by such persons was for the passenger service of himself and his family, corresponding to the service of a team of carriage horses.

If the car is used for a combination of business and personal service the income of the owner may be a little over $3000 as a minimum, and where the owner uses the car for business in the bulk of its service, it is found that a few individuals have as little income as $1800.

On the basis of the figures given it would appear that the United States affords a market for 6,000,000 automobiles at present, and when the ideas embodying improvement and economy are further developed, the sales field may be increased beyond that level. But 6,000,000 automobiles in service would force the horse out of all transportation use. There would be more than two cars for every mile of road in the country and the sentiment against the use of uneconomic elements in road transportation would be overpowering. In the past the record of the bankruptcy courts has shown that business houses persisting in the use of less than the best methods of conducting their businesses have failed.

Transportation is one of the important factors in business. Those houses that did not heed the improvements in transportation and continued to use antiquated and expensive methods in competition with concerns that did appreciate the situation, suffered financially. At present the average user of transportation on the road is meeting with a similar condition to that demonstrated by the experience of business houses. If economic transportation is a factor in his business, and if he persists in using some uneconomic form of transportation, his business must suffer in comparison with that of men who have accepted the fundamental truth.

There are over 6,000,000 farms in the United States averaging 138 acres each. The hauling of produce on the common roads from the farm to the point of shipment or sale, and the hauling of supplies to the farm, the personal transportation incident upon farm life, make up by far the most important element of road transportation and point to the rural districts as the great market of the immediate future for the automobile.

The farmer who hauls his produce, supplies and family by automobile will compete with the farmer who clings to the horse for that service. If the automobile is more economical, the comparison will

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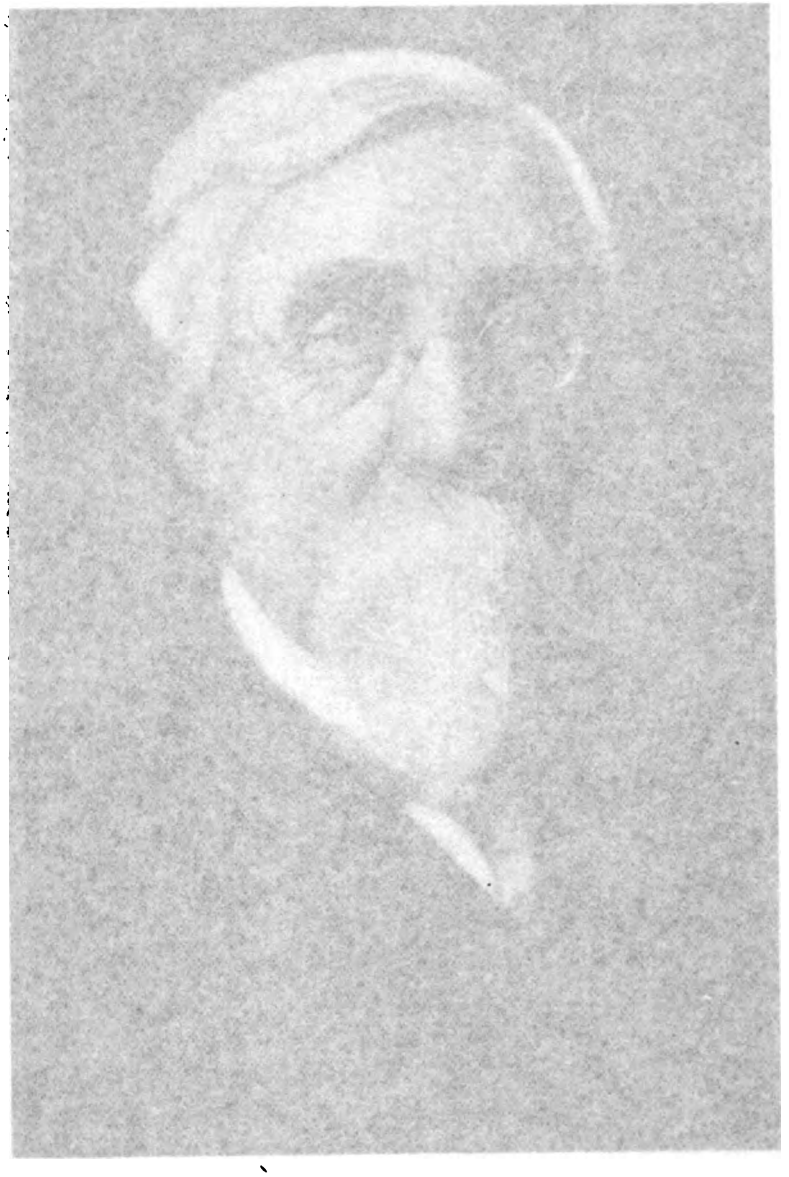

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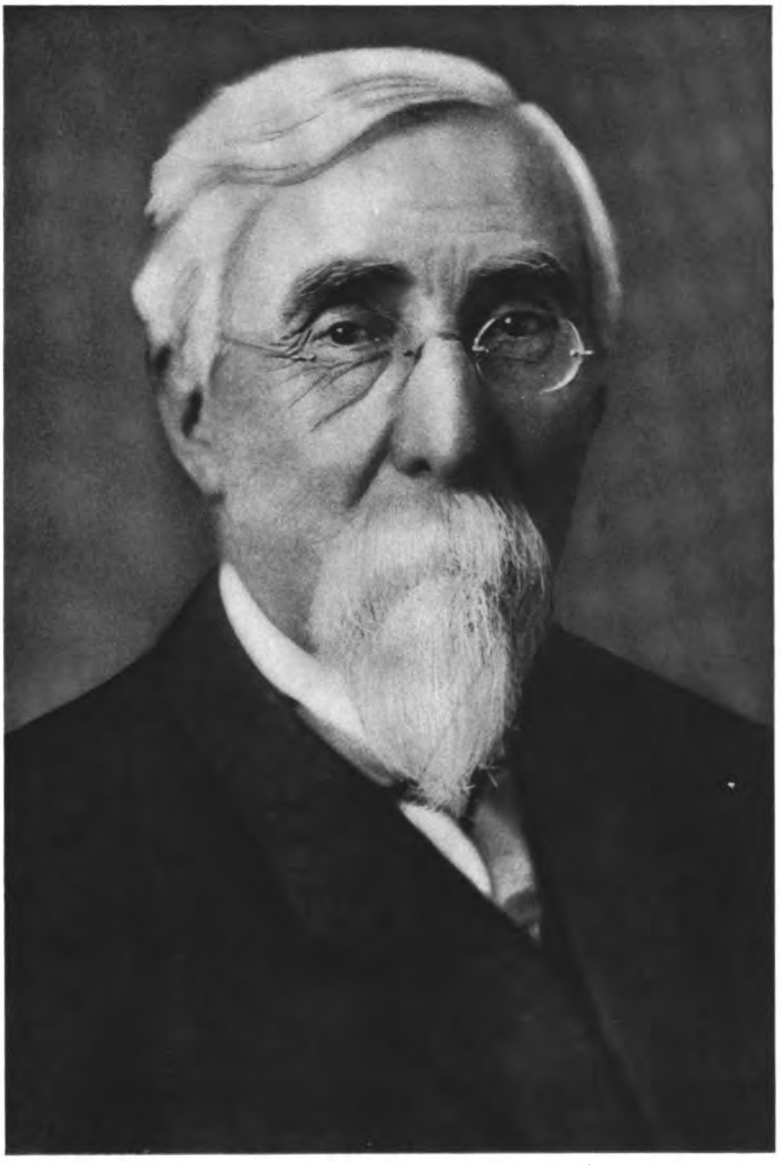

HENRY M. LELAND

Former President of the Society of Automobile Engineers. Cadillac Motor Car Company. Founder Leland & Faulconer Company.

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be to the disadvantage of the horse advocate, because the more progressive farmer will enjoy better and cheaper road transportation and more of it than the conservative.

The fundamental truth has been grasped by the farmers as is indicated by the sale in 1915 of something over 300,000 automobiles to residents of the country districts. But up to this time the sales to farmers have been ordinary passenger automobiles in large majority. This indicates that the first service desired by the farmers is for the transportation of themselves. Secondarily, the cars bought are usable generally for carrying highly valuable shipments of perishable freight and for the hauling of supplies for the farm. Some of the large farms have installed freight automobiles and it is in that direction that there will be an enormous increase in the coming years.

One difficulty that has been encountered is that the average farm is too small to furnish freight for one commercial car all the year around and consequently, while the service the car is capable of performing is satisfactory and economic on a mileage basis, it is not on a volume basis. In some localities this trouble is being overcome by co-operative ownership of a freight automobile by several farmers and in others a regular freight service has been installed on certain routes to handle a specific product, such as milk, between the farms and the creamery, or the railroad shipping point.

Another way in which the use of the freight automobile can be increased in the country by individual farm owners is by the production of a smaller and less expensive type.

The use of second-hand automobiles equipped with freight bodies has become quite general in the outlying sections.

But all these things are simply the results of the working of an economic law. One of the results will prove to be the elimination of the horse from road transportation. This will have the temporary effect of increasing the use of horses in agricultural work, which will increase the productiveness of the farm and give the automobiles more freight and passengers to haul, but inevitably animal service on the farm must go.

The tractor, until now an unpractical dream, and a pretty bad dream, too, has displaced only a comparatively few horses from farm service. It has proved, however, that under certain conditions it is much better than horses. Where the fields are large and their number sufficient to keep it employed, in breaking, plowing, harrowing, seed-

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ing, cultivating and harvesting, even the clumsy, unmechanical and comparatively inefficient tractors of the past demonstrated powers far beyond flesh and blood.

The next great step will be the perfection of tractors that will embody all the strength and mechanical perfection of the automobile in sizes and types that will make their use possible on smaller farms, and when the tractor has been brought to such a stage that the average farmer can own one and keep it busy the horse will be eliminated.

It has required the total annual yield of 100,000,000 acres of our best farm land to feed our horses each year for the past 30! It has required 40 per cent. of our grain crop! It has required the entire yield of 20,000,000 acres of hay land! The horse has eaten annually about 30 per cent. of our hay!

The elimination of the horse will mean a direct saving of $2,000,000,000 a year as well as a tremendous improvement in other ways. More than half of that sum represents horse feed and every ton of it will be available for cattle, hogs, poultry and food animals generally. Under the workings of economic laws that means either more meat or cheaper meat; better living or cheaper living. Either condition is progressive and advantageous to such a degree that there is no reason for arguing the matter.

The horse has no place in the economic scheme of the Twentieth Century. As a pet, or as an adjunct of sport, he may remain indefinitely, but as transportation, his service is being brought to a sudden conclusion.

As the automobile forced the building of good roads, its mission will not be complete until it produces a complete system of good roads. One great reason for the expense of maintaining water-bound macadam is that it could not support traffic consisting of a mixture of horse vehicles and automobiles. In two seasons a new macadam road is frequently reduced to worthlessness by this combination of traffic and while no more water-bound macadam should be built under any circumstances the repair and maintenance of such roads will be comparatively insignificant after horse travel has ceased.

The horse is responsible for the waste of almost all of the money spent on roads since 1904, because the roads were made with horse traffic in view.

Aside from the destructive influence of narrow-tired horse-vehicles, the most wasteful process of destruction is where in northern latitudes

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sharp-shod horses in passing over the highways search out the surface with their calks. If surface water is standing on the roads in small puddles and the penetration of the calk opens a passage from the surface to the foundation of the road through which the water may seep, the damage is done. A severe cold snap, such as nearly all the states north of Alabama, have each winter, comes along. The road freezes, including the little pocket of water let into the surface by the horse's calk and the expansion of the frozen water either breaks up the surface of the road or breaks down the foundation. As this may happen every 10 feet of the road's length the destructive effect may be imagined.

The mission of the automobile, or at least one of them, is to do away with that sort of thing.

Like the surgeon's knife, the automobile has to destroy before it can build up. The surgeon cuts out the tumor before he can call into use the curative agents of his art, and the automobile has to destroy less economic forms of road transportation before it can build to perfection a road system. Animal transportation is the relatively useless, uneconomic excrescence that must be removed like a tumor from the side of the nation before the full advantage can be taken of free circulation in the arterial system of good roads.

Looking forward to the time when 6,000,000 automobiles are running on a system of roads that is being steadily and rapidly improved, the constructive effect of the automobile will be apparent everywhere. Every arable acre in the land will be subject to cultivation, through the extension of transportation facilities on the road. Agricultural production could be doubled with ease and will be increased as fast and as far as is required by the demands of mankind. It will have an extraordinary effect upon mining, by bringing into the market ore that could not pay for horse transportation and by opening up new low-grade fields. In like measure it will add to the margin of profits of mining enterprises now using horse transportation and making a profit from operation. In the fisheries the value of the automobile is measured simply as an improvement over forms of land transportation now in use that it will replace. But its cousin, the motor-boat, has already revolutionized fishing for the market.

In full flower, the automobile will wipe out state lines in this country by bringing the people of every section into closer contact and disseminating fuller knowledge among them of their neighbors. And as

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disagreements, prejudice and even war are the results of placid ignorance, converted into ignorant misunderstandings and from that stage to violent hatred, the mission of the automobile in bringing about a more complete knowledge of the other people is of special importance.

It will enrich blood lines by allowing young people to meet who never could have met except through its service; it will increase the efficiency of the individual by allowing a greater radius of action and it has served and will serve in increasing ratio to improve the health of all mankind.

Something has served to add about two years to the average life since 1900, according to the official reports. This gain has been specially marked in the great cities and is not so noticeable in the country. In both city and country improved sanitary measures have been urged and followed to a certain extent, but the great difference in conditions that obtained in cities prior to 1900 and in 1915 is that the horse is disappearing from the cities. There is a country-wide crusade against flies and the fact is well established that the fly breeds and flourishes near the horse. By eliminating the horse from cities the authorities can cope with the fly and by reducing the number of stables in town, they can gain the upper hand. This has been done in some of the cities; notably those whose health reports show the most improvement in the matter of lengthening human life.

When the horse has been eliminated entirely and when sanitary measures are observed to prevent the breeding of flies, it is clearly within the vision that human life may be extended on the average for five years or more, because the scientists have discovered that flies spread febrile diseases and fever kills its victims by the tens of thousands.

When the last horse stable has been torn down in the cities and the ground under it sterilized the health authorities are confident that the fly will be wiped out and with it one of the most useless menaces to human life.

Against all these tremendous advantages of the present and the still greater developments of the immediate future that are promised through the automobiles there are many minor elements of disadvantage charged.

Motorists themselves are accountable for most of these through the bigotry and ignorance of some of them. Many of them are not ready to acknowledge that all users of the road, including pedestrians, have

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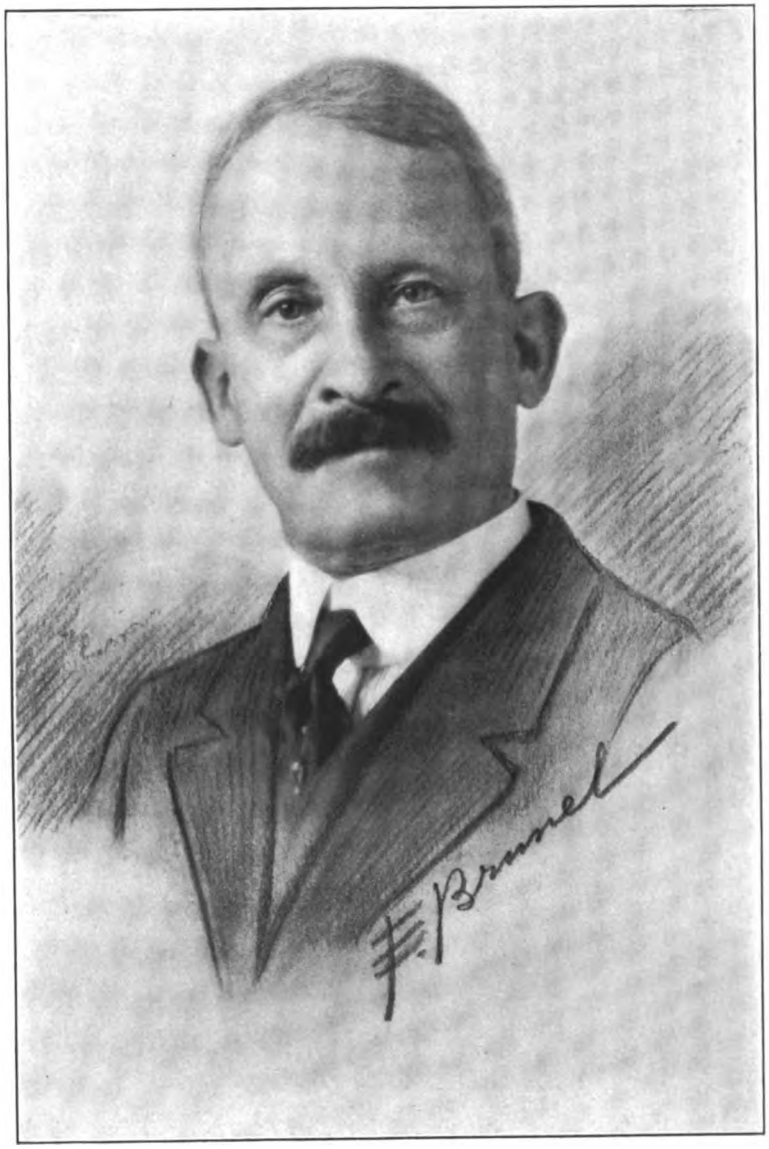

JOHN C. WETMORE

Dean of the automobile writers—a power in pioneer days and an educational influence of the present.

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equal rights. There are some who still hold that a toot of the horn absolves them from consequences where preventable accident follows and that if they drive within the speed limit they are driving with due care and diligence.

These things have caused accidents, many of them, but the fact of the matter is, a considerably larger part of automobile mishaps should be charged to the stupendous, monumental ignorance of automobiles, exhibited by the daily press.

Barred from personal ownership of a car, by reason of meager pay, the simon-pure editorial newspaperman is densely ignorant of the whole subject. He may know politics, finance (from the theoretical point of view), police, society and all the other channels of newsgetting, but of the automobile he knows nothing.

He has gained his impressions from the "hooraw" advertising indulged in by the automobile makers and sellers of an earlier day; from the races and speed contests staged under his observation.

It is these newsmen who write the matter appearing in the press that anybody takes the trouble to read. The so-called automobile departments probably have a purpose, but it is not the same purpose as that of the real news columns and is treated accordingly by the public. The real automobile departments, which are carried in an astonishingly few of the newspapers, are conducted by automobile experts, but reports of accidents have no place in them, for obvious reasons.

Even the writers who produce the "editorials" are afflicted with the same disease when they touch on automobile subjects.

No wonder then that the care and accuracy that mark other reports should be so painfully lacking in covering automobile news.

But the main reason for the attitude of the press concerning the automobile is more deeply seated than reportorial ignorance of the subject. There is an excellent reason for the ignorance, aside from the simple fact that reporters never yet made money enough to warrant them in owning such machines and consequently always regarded them as being like an eight-room flat, "possible, but not among the probabilities."

The real reason lies in the fact that almost from the beginning of the automobile it was popular to oppose it. The impudence of a few early motorists aggravated the non-motoring public; over-rode their rights and showed a careless disregard for everybody except themselves. The attitude of the press at that time was not unjust but the

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astonishing development of the automobile has produced a condition entirely unique in history, where the press, generally and broadly, is wrong.

Search the records of the press in any country where it is or has been free and you will find no great question upon which the attitude of the press has been so consistently wrong as it has been with regard to the automobile.

It drew its impressions from the flagrant impudence of a few early motorists. It overlooked the fact that the automobile is transportation and is the only improvement on the roads in 40 centuries. It applauded the silliest of legislative efforts to suppress or limit the scope of the automobile and has persistently displayed a hostility toward the whole art that was only matched by its ignorance of the facts.

It publishes columns of grouped automobile accidents; gives its space, editorial as well as news, to the presentation of certain alleged statistics concerning automobile accidents, the sources of which are admittedly the columns of the papers that display the statistics and others equally badly informed and which are compiled with the single purpose of giving smart men profitable employment.

The press inveighs against speed, advocates limits by statute and weeps and wonders why accidents continue to happen.

The useful service of the automobile to all humanity is overlooked. Its contribution to the art of transportation is not recognized. In the view of some of the press, the automobile is to-day a juggernaut, a motoring speed-monster, intent on killing and maiming all who stand in its way. The motorist, in this view of the press, is an intoxicated savage, in charge of a dangerous device. One of the leading editors of New York recently informed the writer of this article that the only way the automobile can gain mention in the news columns of his paper is when it runs over someone!

It may be mentioned in passing that the same paper conducts one of the largest and least read automobile departments in the United States.

Under the influence of the hostile attitude of the press, the public has been misinformed of its duties and the flames of hatred and prejudice have been fanned against motoring.

The impression has been given that more laws are required to curb fast driving, while the statistics prove that 90 per cent. of the

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F. ED. SPOONER
Publicity expert known all over the world as "On-the-Spot."

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accidents contain at least an element of contributory negligence on the part of the victim, while 9 per cent are just plain accidents in which neither driver nor victim is blameworthy and in less than 1 per cent of all accidents where the victim is not a passenger or driver, is the motorist wholly to blame.

Accidents are casualties sincerely to be deplored. Full 90 per cent of them are preventable, not through the enactment of more unconstitutional statutes, but through the education of the whole public to a knowledge of the facts, by a truthful, intelligent presentation of the facts in the news columns of the daily press. The killing and maiming of children must be stopped, not by lynching a truck driver whose machine crushes the life from some romping child unfortunate enough and careless enough to fall under its wheels, but by impressing the principles of Safety First on the parents and teachers of children, through the medium of the daily press.

It is lamentably true that reckless motorists have had little regard for the law and rather less for the public. Naturally, no matter how reckless a motorist may be, he does not operate his car with the affirmative intention of killing anyone. When the reckless motorist drove a horse his attitude toward the public was exactly the same as it is to-day. Now that he has a car, the only difference is that his power to harm the public is increased. He is the most serious of all the problems that the automobile industry has had to face, and with the help of the press he can be handled. The way to do it, however, is not to enact laws that will raise presumptions in his favor or that will lend him the protection of public sympathy. About a dozen 20-year penitentiary sentences for reckless driving that develops into manslaughter would put a period on his activity. The existing laws afford him the means of escaping severe consequences resulting from his recklessness. The solution of the problem is to repeal the laws and call reckless drivers before the scale and sword of the Blindfolded Goddess, Justice, standing on the Common Law.

The mission of the automobile is to serve mankind, by improving road transportation and through that improvement to foster knowledge, increase wealth, improve health, better living conditions, eliminate waste and add to the joy of living.

The mission of the automobile is to increase personal efficiency; to make happier the lot of people who have led isolated lives in the

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country and congested lives in the city; to serve as an equalizer and a balance.

Elegant in lines, powerful in action, wide in service, economical in operation, the modern automobile represents the incarnation of the transportation art—the silent, always-ready servant that has more strength than Aladdin's genii, and that already has accomplished vaster works for mankind's betterment than anything that has gone before.

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INDEX OF ILLUSTRATIONS

	PAGE
Charles Goodyear	*Frontispiece*
Walter Hancock's "Enterprise"	2-3
Early British Steam Stage	2-3
De Dion-Bouton Steam Tractor	6-7
Panhard of 1894	6-7
Charles E. Duryea	12-13
Elwood Haynes	12-13
Alexander Winton	12-13
Ransom E. Olds	12-13
Selden Car	18-19
Morris & Salom "Electrobat"	18-19
Henry Ford in His First Car	18-19
Mueller-Benz in First Road Race	18-19
Duryea's First Race Winner	20-21
First Haynes Car (1894)	24-25
Haynes Times-Herald Race Car	24-25
Columbia of 1898	24-25
W. C. Anderson	26-27
Seven White Steamers	28-29
Windsor T. White	28-29
First Gasoline Automobile Sold in America	28-29
Stearns Car of 1896	28-29
White Steamer of 1901	28-29
Elmer Apperson	32-33
John Wilkinson	32-33
Joseph W. Moon	32-33
Hayden Eames	32-33
Pierce-Arrow of 1901	34-35
Pierce-Arrow of 1906	34-35
Pierce-Arrow of 1916	34-35
Moon, 1906	34-35
Packards—1900-1914	36-37
Alden L. McMurtry	36-37
Automobile Motors: Packard 4, 6 and 12 Cylinders	36-37
Automobile Motors: Franklin 4 (1903), 6 (1916)	36-37
John North Willys	40-41
George W. Bennett	40-41
Sidney D. Waldon	40-41
William Mitchell Lewis	40-41

Digitized by Google

PAGE

H. M. Jewett 44-45
W. H. VanDervoort 44-45
Howard C. Marmon 44-45
Lewis Harris Kittredge 44-45
Charles W. Nash 48-49
George E. Daniels 48-49
Alvan Macauley 48-49
J. Walter Drake 48-49
George Baldwin Selden 54-55
Herman F. Cuntz 58-59
Henry Ford 70-71
Louis Henry Perlman 86-87
Clyde Jay Coleman 94-95
John Boyd Dunlop 108-109
Thomas B. Jeffery 108-109
Harvey S. Firestone 120-121
Horace De Lisser 120-121
Seneca G. Lewis 120-121
Harold O. Smith 120-121
Samuel Pomeroy Colt 134-135
James Newton Gunn 134-135
John W. Bate 148-149
The Maxwell of 1916 148-149
Henry Souther 148-149
Walter E. Flanders 156-157
William E. Metzger 156-157
Hugh Chalmers 160-161
Howard E. Coffin 164-165
Andrew Lawrence Riker 164-165
Charles C. Hanch 166-167
Milton J. Budlong 170-171
Alfred Reeves 172-173
Samuel Arthur Miles 172-173
Charles Clifton 186-187
David J. Post 200-201
Henry Winfield Chapin 200-201
Officers American Automobile Association 210-211
Horace Monroe Swetland 224-225
Coker F. Clarkson 224-225
Thomas J. Fay 232-233
E. T. Birdsall 232-233
Albert R. Shattuck 240-241
Dave Hennen Morris 240-241
Charles Thaddeus Terry 248-249
William A. Redding 260-261

Digitized by Google

PAGE
Roy D. Chapin 264-265
Henry B. Joy 268-269
William Crapo Durant 294-295
Benjamin Briscoe 298-299
F. C. Chandler 306-307
W. M. Anthony 306-307
W. K. Vanderbilt, Jr., and Cup 318-319
Vincent Astor and Trophy 318-319
Result of Big Motor, Medium Chassis and High Speed 320-321
Result of Defective Steering Mechanism 320-321
Duryea Winning Times-Herald Race (1895) 320-321
Sturges Electric 320-321
Fiat (320 Horsepower) 322-323
Tracy in 1905 Locomobile 322-323
F. E. Moscovics 324-325
A. C. Newby 328-329
Grand Prize Winner (1908) 328-329
Charles J. Glidden 328-329
Elmer Rand Hollander 328-329
James C. Nichols 332-333
Sheepshead Bay Speedway 332-333
Stutz, Winner Astor Trophy, 1915 336-337
Detroit Electric on Mt. Washington, 1906 338-339
William P. Kennedy 344-345
Service Curve of the Truck 350-351
E. Ralph Estep 400-401
George M. Dickson 416-417
William Phelps Eno 420-421
George W. Houk 428-429
Henry M. Leland 434-435
John C. Wetmore 438-439
F. Ed. Spooner 440-441

Digitized by Google

GENERAL INDEX

The following compilation covers the important chapter references to men, companies and events described:

A

	CHAPTER
A-Z Company	V
Abbott	I
Abbott-Detroit	V
Abbott Bull-Dog	XI
Acme Motor Car Company	I:V
Adams Express Company	X
Adams-Farwell	I
Adams, Louis R.	V
Adler, H. W.	X
Advance	I
Ajax-Grieb Rubber Company	V:VIII
Ajax Standard Rubber Company	VIII
Aitken, John	IX
Albany	I
Albresch, Charles, Carriage Company	X
Alco	I:V:IX:X
Alden, Herbert W.	V
Alden Sampson Mfg. Co.	I:IV:VIII:X
Allen-Kingston	I
Allen Motor Car Co.	V
Alley, Tom	IX
Allison, J. Wesley	V
Allison, Robert	I
Altman & Co., B.	X
American	I
American Automobile Association,	V:VII:IX:X
American Ball Bearing Company	V
American Bankers' Association	VIII
American Bicycle Company	VIII
American Bronze Company	V
American Chain Company	II
American Coil Company	V
American Cycle Company	VIII
American Electric Car Company	V:X
American Ever Ready Company	V
American Express Company	X
American Gear & Manufacturing Company	V:VIII
American Hardware Corp.	V
American Institute of Electrical Engineers	X
American La France Fire Engine Co.,	V:VIII
American Locomotive Company	VIII
American Mors	I
American Motor Car Manufacturers' Association	V
American Motorist, The	V
American Motor League	V
American Motors Corporation	VIII
American Motor Truck Company	X
American Napier	I
American Sheet & Tin Plate Co.	V
American Society of Heating and Ventilating Engineers	V
American Roller Bearing Company	V
Amoskeag Corporation	X
Anderson Electric Car Company	V
Anderson Electric Carriage Co.	I:V:IX
Anderson, Gil	IX
Anderson, Henry B.	V
Anderson, Sir James C.	I
Anderson, Judge	VIII
Anderson Trophy	V:IX
Andrews, Horace E.	V
Andrews & Company	VIII
Anglo-American Rapid Vehicle Company	X
Apperson Brothers Automobile Company	I:V:VIII
Apperson, Elmer	I:X
Apple Electric Company	V
Apple, V. G.	V
Ardsley Motor Car Company	V
Argo Electric Vehicle Company	V
Argo Motor Company	V
Association of Licensed Automobile Manufacturers	II:V:VI
Astor Challenge Trophy	IX
Astor, William Vincent	IX
Atlanta Speedway	IX
Atlas	I
Atterbury Motor Car Company	X

Digitized by Google

CHAPTER

Auburn Automobile Company.I:V:VIII
Aurora Automatic Machine Co.....V
Austin Automobile Company.....I:V
Austin Walter.....V
Auto Coil Company.....V
Automatic Air Carriage Company.VIII
Autocar Company.....I:V:VIII:X
Automobile Board of Trade.....V
Automobile Club of America, I:V:VIII:IX:X
Automobile Club of France .....IX:X
Automobile Club of Hartford IX
Automobile Club of New Jersey.....V
Automobile Club of Utica V
Automobile Fore-Carriage Co.....VIII
Automobile Maintenance Company...X
Automobile Topics X
Automobile Supply Mfg. Co.....V
Avery Company, The.....V:X

B

B & R Shock Absorber Company....V
Babcock Electric.....I
Bache, J. S., & Co.....I
Bachellor, Irving.....II
Badger Brass Manufacturing Company V
Baker Day.....V
Baker, R & L., Co.....V:VIII
Baker Motor Vehicle Company..I:V:X
Baldwin Chain & Manufacturing Co..V
Baldwin Cycle & Chain Co.....V
Baldwin, L. F. N.....X
Baldwin Motor Vehicle Company..VIII
Ball Brothers Fruit Jar Co.....VIII
Ballantyne V
Ball, Guy.....IX
Barney, Charles D., & Co.....VIII
Bartholomew, J. B.....V
Bartlett, William Erskine.....III
Batavia Rubber Company.....V:VIII
Bartholomew Company, The.....V
Batchelder, Amos G.....Int.:I:V:VII
Bate, John W.....I:IV
Beach, E. W.....V
Bearings Company of America.....V
Becker, A. G., & Co.....VIII
Beecroft, David.....IX
Belvin, Preston.....V
Benford Manufacturing Co.....V
Bennett, George W.....I
Bennett, James Gordon.....IX
Bennett Trophy.....IX
Benz, Carl.....Int.:I:II:IX:X
Berg, Otto.....X
Bergdoll, Erwin.....IX
Bergdoll Motor Car Company.....I
Bergman, A. C.....V
Bernin IX
Bertolet I
Bessemer X
Best Manufacturing Co.....X
Best X
Betts, Frederick S.....II:VI
Bigsby Rotary Mfg. Co.....V
Bijur Motor Lighting Co.....V
Billings, F. C.....V
Billings & Spencer.....V
Birdsall, E. T.....V
Bishop, D. Wolfe.....IX
Black I
Black, William E.....VIII
Blackledge, John W., Mfg. Co.....V
Blair X
Blair, James A.....V
Blaisdell X
Blanchard, Thomas.....I
Bliss, E. W., Co.....V
Blitzen Benz.....IX
Blood, William H., Jr.....V
Bock Bearing Co.....V
Boillot IX
Bollee, Amadee.....I:IX
Bonnell, Horace A.....V
Bonner, Robert.....V
Boothroyd, A.....III
Borland-Grannis Company.....V
Bosch Magneto Co.....V
Bossert & Co.....V
Boston Automobile Truck Co.....X
Bostwick, Albert C.....V:IX
Boulton, Matthew.....I
Bourquin, James F.....I
Bouton, G.....I:III
Bower Roller Bearing Co.....V
Bowling Green.....X
Bowman, Sidney B.....II
Bowser, S. F., Co.....V
Bradbury, F. D.....V
Bradford, Governor William.....V
Brady, Anthony N.....I:II
Brady, James C.....V
Bragg, Caleb.....IX

Digitized by Google

CHAPTER

Brannigan, Robert A.....V
Brayton .....I:II
Brazier IX
Brazier, H. B.....V
Breeze Carbureter Co.....V
Brennan Mfg. Co.....V
Briggs-Detroiter V
Briggs Manufacturing Co.....V
Briggs & Stratton Co.....V
Briscoe, Benjamin.....V
Briscoe Mfg. Co.....V:VIII
Briscoe Motor Corp.....V
Broadwell, E. H.....V
Brooklands Speedway.....IX
Brooks, John N.....V
Brown, A. T.....III
Brown, E. F.....V
Brown, Joseph R.....X
Brown-Lipe-Chapin Co.....V
Brown-Lipe Gear Co.....V
Brown, William.....V
Brown & Sharpe Mfg. Co.....V
Bruce-Brown, David.....IX
Brush, Alanson Partridge.....I
Brush Runabout Co.....I:VIII:X
Brunn I
Buckeye Mfg. Co.....X
Buda Company.....V
Budd, Edward J., Mfg. Co.....V
Buffalo Electric Car Co.....V
Buffalo Automobile Club.....IX
Buhl, William E.....I
Buick Bug.....IX
Buick Motor Company, I:IV:V:VIII:IX:X:XII
Bull, Frank K.....VIII
Burbeck IX
Burman, Robert.....IX
Burr, George H., & Co.....VIII
Buzby, Winslow E.....V
Butler, Samuel M.....V:IX
Byrider I
Byrne-Kingston Co.....V

C

Cadillac Automobile Company.....I
Cadillac Motor Car Company, I:II:IV:V:VIII:X:XII
Cady, William B.....I
Caley, F. D.....X
Callan Act.....VI
Cameron I
Canfield, Frank W.....II
Cardoza & Nathan.....I:II
Carr, F. S., Co.....V
Carter I
Cartercar Company.....I:II:VIII
Carlysle & Johnson Machine Co.....V
Carpenter, Prof. R. C.....I
Carpenter Steel Co.....V
Case, J. I., Threshing Machine Co., I:II:V:VIII
Castle, F. E.....V
Catlow, James N.....II
Central Trust Company.....VIII
Chadwick Engineering Works.....I
Chalfant, E. P.....V
Chalmers Detroit.....I:IX
Chalmers Motor Company, I:V:VIII:IX
Chalmers, Hugh.....I:IV:V
Chamberlin, George F.....V:IX
Champion Ignition Co.....V
Champion Machine & Forging Co....V
Chandler, F. C.....I
Chandler Motor Car Co.....I:V:VIII
Chapin, Henry Winfield.....V
Chapin, Roy D.....I:V:VII
Chase X
Chase, Julian A.....V
Chase, L. C., Co.....V
Chase National Bank.....VIII
Chatham & Phenix Nat'l Bank....VIII
Chevrolet, Louis.....IX
Chevrolet Motor Co.....I:V:VIII
Chicago Automobile Club.....V:IX
Chicago Motor Club.....IX
Chicago Motor Vehicle Co.....X
Chicago Speedway IX
Chicago Pneumatic Tool Co.....X
Chicago & Alton.....IX
Choate, Rufus.....I:III
Christiaens IX
Christie IX
Clarke, H. J.....V
Clarke, John S.....I
Clarke, Louis S.....I
Clarkson, Coker F.....V
Clement IX
Clement-Bayard IX
Clement-Ferrand III
Clerk, Dugald.....II
Cleveland I

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	CHAPTER
Cleveland Automobile Club	V
Cleveland Car Specialty Co	V
Cleveland Tanning Co	V
Clifton, Charles	I:II:IV:V:VII:X
Clothier & Tyler	VIII
Coates-Goshen	I
Cobe, Ira M	V
Coes Wrench Co	V
Coffin, Howard E	I:IV:V:X
Cole Motor Car Company	I:V:VIII
Coleman, Clyde Jay	II
Coliseum	V:X
Colt, Pomeroy Pomeroy	III
Columbia Automobile Co	X
Columbia Electric Vehicle Co	VIII
Columbia-Knight	V
Columbia Lubricants Co	V
Columbia Motor Car Company	VIII
Columbia Nut & Bolt Co	V
Columbus Buggy Co	I
Commerce	X
Commercial Vehicle & Power Wagon Co	X
Condict G. Herbert	X
Connaught, Duke of	V
Connecticut Telephone & Electric Company	V
Consolidated Mfg. Co	V
Consolidated Motor Car Co	VIII
Consolidated Rubber Tire Co	VIII
Contest Board	V
Continental Automobile Co	X
Continental Motor Mfg. Co	V
Continental Rubber Works	V
Coppock Motor Car Company	I:X
Corbin	I
Corcoran Lamp Co	V
Cotta Transmission Co	V
Coulthard	X
Couple-Gear Freight Wheel Co	X
Courier	I:IV
Couzens, James	V
Covert Motor Vehicle Co	V
Cowles, C., & Co	V
Coxe, Judge	II
Cramp, William, & Sons, Ship and Engine Bldg. Co	V
Crescent Automobile Co	V
Crosby Co., The	V
Cross-Licensing Agreement	V
Crown	I
Cruickshanks Engine Works	X
Cryder, H. C	VIII
Cudahy Packing Co	X
Cugnot, Nicholas Joseph	Int.:I:II:X
Cunningham, James, Son & Co	I:V
Cuntz, Herman F	Int.:II
Cutler, C. H	V

D

Dagenhardt, Fred	II
Daimler, Gottleib	I:II:X
Daimler Mfg. Co	V:X
Dance, Sir Charles	I
Daniels Motor Car Co	VIII
Darling, Robert	V
Darracq	IX:X
Dart	X
Dawson, Joseph	IX
Day, George H	II:V
Davis, S. T., Jr	I:V:IX
Dayton Electric Co	V
Dayton Electric Mfg. Co	V
Dayton Engineering Laboratories Co.	II:V:VIII
Dayton Motor Car Co	I:V:VIII
De Dietrich	IX
De Dion, Count A	I
De Dion & Bouton	I:VIII
De Dion-Bouton-Motorette Co	V
Delahaye	X
Delco	VIII
De Lisser, Horace	III:VIII
De Luxe	I
Deming, Paul H	V:IX
Denby Motor Truck Co	V
De Palma, Ralph	IX
Department of Agriculture	VII:IX
Depew, Sherman L	I
Detroit	I
Detroit Automobile Co	I:X
Detroit Edison Illuminating Co	II
Detroit Lubricator Co	V
Detroit Seamless Steel Tube Co	V
Detroit Steel Products Co	V
Detroit Trophy	IX
Diamond Chain & Mfg. Co	V
Diamond Rubber Co	III:V:VIII
Diamond, T	X
Diehl, George C	V
Dietz, R. E., Co	V
Dime Savings Bank of Detroit	VIII
Disbrow, Louis	IX
Dixon, Joseph, Crucible Co	V

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CHAPTER

Dodge Brothers.....I:IV:V:VIII
Dodge, Horace E.....I
Dodge, John F.....I
Dodge, Col. Theodore A.....III
Doehler Die Casting Co.....V
Dolan.....I:II:VIII
Donald, F. C.....V
Donaldson, Henry F.....V
Dorris.....I
Dort Motor Car Co.....I:V:VIII
Double-Fabric Tire Co.....V
Dover Stamping & Mfg. Co.....V
Dow, L. S.....X
Downing, J.....V
Drake, Col. E. L.....XI
Drake, J. Walter.....IV
Dreadnaught Tire & Rubber Co.....V
Dry Dock Company.....II

CHAPTER

Dudgeon, Richard.....I
Duerr, C. A., & Co.....II
Duesenberg.....IX
Duff Mfg. Co.....V
Duffy, J. H.....II
Duncan, Frederick S.....II
Dunlop, John Boyd.....III
Dunn, Harry T.....V
Durant, William Crapo....Int:II:VIII
Durant Dort Motor Car Co.....I:V:X
Duray, Arthur.....IX
Durham Co.....VIII
Duryea, Charles E....I:II:IV:V:IX:X
Duryea Power Co.....V
Duryea Motor Wagon Co.....X
Dyer, Leonard Huntress..Int.:II:V:VI
Dykes, John L. G., Co.....V
Dyneto Electric Co.....V

E

Eames, W. T.....II
Eaton, William L.....II
Edge, S. F.....IX
Edison Storage Battery Co.....V:X
Edmunds & Jones Mfg. Co.....V
Eisenhuth Horseless Vehicle Co.....X
Electric Auto-Lite Co.....V
Electric Carriage & Wagon Co.....X
Electric Motor Vehicle Co.....V
Electric Storage Battery Co.....I:II:V
Electric Vehicle Company, I:II:V:VIII:X
Electric Vehicle Manufacturers' Association.....V
Elkhart Carriage & Motor Co.....V
Elkins, Steven B.....II:VIII:X
Elliott, Frederick H.....V
Elmore Mfg. Co.....I:VIII
Emise, Charles E.....I
Empire Automobile Co.....V
Empire Rubber & Tire Co.....V
Endurance Tire & Rubber Co.....V
Engineers' Club.....X
English & Mersick Co.....V
Eno, William Phelps.....Int.:XI
Enos, Laurens.....V
Entz Motor Patents Corp.....VIII
Erickson, Capt.....IX
European War, I:II:III:IV:V:VII:VIII:IX:X
Evans, Henry.....V
Evans, Oliver.....Int.:I:II:X
Evans, Powell.....V
Everitt, B. F.....I:IV
Everitt, Metzger, Flanders Co., I:IV:VIII
Excelsior.....IX
Excelsior Supply Co.....II

F

Fafner Brewing Co.....V
Fairfield, C. S.....X
Farmer, Frank.....I
Farmers' Union.....VII
Farson, John.....V
Faulconer.....I
Fay, Thomas J.....V
Fedders Mfg. Works.....V
Federal Motor Truck Co.....V:X
Federal Motor Works.....VIII
Federal Rubber Mfg. Co.....V
Ferguson, Ernest L.....Int.:IX
Fergusson, David.....V
Ferro Machine and Foundry Co.....V
F. I. A. T.....V:VIII:IX
Field, C.....V
Fifth Avenue Coach Co.....X
Findeisen & Kropf Mfg. Co.....V
Fischer, A.....IX
Fish, Frederick.....V
Fisher, Carl G.....VII:IX
Fisher, J. K.....I

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CHAPTER

Fisher Equipment Co.....X
Fisk Rubber Co.....V:VIII
Firestone Tire & Rubber Co. III:V:VIII
Firestone, Harvey S.....III
First Regiment Armory.....V
Flagler, John H.....V
Flanders, Walter E.....IV
Fleischmann, Max C.....V
Fleiss, R. A.....X
Flint, Charles R.....III:V
Florida East Coast Automobile Association.....V
Flower Brothers.....II
Forbes, Thomas.....I
Forbes Varnish Co.....V
Ford, Henry.....Int.:I:II:IV:IX
Ford Motor Co....I:II:IV:V:VIII:XII
Forrest, General Nathan.....VII
Foster, J. H.....V
Four Wheel Drive.....X
Franklin, H. H.....I
Franklin, H. H., Mfg. Co., I:V:VIII:X:XI
Frontenac.....I
Frayer-Miller.....X

G

Gabriel Horn Mfg. Co.....V
Gaeth, Paul.....I:X
Gage, Lyman J.....II
Gallagher, E. B.....V
Garage Equipment Co.....V
Garford Mfg. Co.....I:IV:VIII:X
Gary, E. H.....V
Gas Engine & Power Co.....V
Gemmer Mfg. Co.....V
General Alumni Ass'n of America...VI
General Carriage Co.....X
General Electric Co.....VIII
General Motors Co. of Mich.....VIII
General Motors.....I:V:VIII
General Motors Truck Co.....V
General Rubber Co.....VIII
General Vehicle Co.....V:VIII:X
Gibbs, W. W.....X
Gibney Tire & Rubber Co.....V
Gillette, C. H.....V
Girardot.....IX
Girl, Christian.....V:XI
Glidden, Charles J.....V:IX
Glidden Tours.....V
Glidden Trophy.....V:IX
Glide.....I
Globe Machine & Stamping Co.....V
Glynn, Martin.....VII
Golde Patent Mfg. Co.....V
Goldman, Sachs & Co.....VIII
Goodrich, B. F., Co.....III:V:X
Good Roads Commission.....V
Goodyear, Charles.....Int.:III
Goodyear Tire & Rubber Co., III:V:VIII
Gorham, Sidney S.....V:VI
Gormully & Jeffery Tire Company, I:II:III:V:VIII
Gormully.....I:III
Gorton, W. S.....V
Goss, M. L.....V
Gould Storage Battery Co.....V
Graham, D. F.....V
Gramm-Bernstein.....X
Gramm Motor Truck Co.....V:X
Grand Central Palace.....V:X
Grand Prize, Automobile Club of America.....IX
Grand Prix de France.....IX
Grand Rapids Automobile Club.....V
Grant, Arthur W.....I:II
Grant, Harry.....IX
Grant-Lees Gear Co.....V
Grant Motor Co.....I:V:VIII
Grant, W. W.....V
Gray & Davis.....V
Great Western Automobile Co.....I:V
Green, Charles Truax.....II
Grieb, William G.....VIII
Grieb Rubber Co.....VIII
Grossman, Emil.....V
Gude, O. J.....II
Gugro, C. H.....V
Gunn, James Newton.....III
Gurney, Goldsworthy.....I:X
Gwynn Brothers.....VIII

H

Hall, A. M.....VIII
Hall, C. M., Lamp Co.....V
Hall, William Henry.....V
Halladay, L. P., Co.....V
Halstead.....II
Ham, C. T, Mfg. Co.....V

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CHAPTER

Hamm, C. T., Mfg. Co.....V
Hampton Carbureter.....XI
Hanch, Charles C.....V
Hancock Mfg. Co.....V
Hancock, Walter.....Int.:I:III:X
Hardman Tire & Rubber Co.....III
Harding, J. Horace.....VIII
Hardy, R. E., Co.....V
Harkness Gold Cup.....IX
Harkness, Harry S.....IX
Harris, A. W., Oil Co.....V
Harris, W. T.....V
Harroun, Ray.....IX
Hartford Machine Screw Co.....V
Hartford Rubber Works.....V:VIII
Hartford Suspension Co.....V
Hayden, Stone & Co.....VIII
Hayes Wheel Co.....V
Hassler, Robert H.....V
Haynes-Apperson Co.....V
Haynes Automobile Co.....I:V:IX:X
Haynes, Elwood.....I:II:IV:V:X
Hayward, Nathaniel.....I:III
Hearne, Ed.....IX
Heath, George.....IX
Hedge, Homer W.....V
Heinze Electric Co.....V
Heinze Pickle Co.....X
Hemery.....IX
Hemphill, Alexander J.....V
Henderson, Thomas.....V
Herd, Anderson T.....IX
Herreshoff.....I
Herschmann.....X
Herz & Co.....V
Hess-Bright Mfg. Co.....V
Hess, Henry.....V
Hess Spring & Axle Co.....??
Hewitt, John H.....X
Hewitt Motor Co.....V:XIII
Hewlett, E. H.....I
Hill, James J.....VIII
Hill, J. M.....V

CHAPTER

Hills, F.....I
Hine, Francis L.....VIII
Hine-Watt Co.....V
Hirsh.....IX
Hoadley, Joseph.....X
Hodges, Charles F.....I
Hodgman Rubber Co.....V
Hoffecker Co.....V
Hollander, Elmer Rand.....Int.:V:IX
Holley Bros. Co.....V
Hollister, Frank C.....V
Holmes, Arthur.....V
Holsman.....V
Hood Rubber Co.....V
Hooper, Robert P.....V
Hoosier Kitchen Cabinet.....VIII
Hornblower & Weeks.....VIII
Horseless Age.....I:X
Horseless Vehicle Company.....VIII
Hotchkiss, William H.....V
Hough, Judge Charles M.....II:V:VI
Houk, George W.....XI
Houk Mfg. Co.....V
Houpt, Harry S.....I
Hoyt, Colgate.....V
Howell, T. P., & Co.....V
Hower, Frank B.....IX
Hows, George A.....V
Hubbard, Elbert.....III
Hubert, Conrad.....II
Hudson Motor Car Company, I:V:VIII:XII
Hughes, Hugh.....IX
Humber Motor Co.....X
Hunker, Jules.....X
Hunt, Judge.....II
Hupmobile.....I:IV:X
Hupp Motor Car Company.....VIII
Hupp Motor Car Corporation, I:V:VIII
Hussey, P. L.....V
Hyatt Roller Bearing Co.....V:VIII
Hydraulic Pressed Steel Co.....V

I

Illinois Electric Vehicle Transportation Co.....X
Imperial Brass Mfg. Co.....V
Importers' Automobile Salon.....V
Indiana Bicycle Co.....X
Indianapolis Speedway.....IX
Insull, Samuel.....X
International Automobile and Vehicle Co.....VIII
International Harvester Co.....V
International Motor Carriage Co.....V
International Motor Co.....V:VIII
International Power Co.....X
International Rubber Co.....V
Inter-Ocean Chicago Meet.....X
Interstate Automobile Co.....V:VIII
Interstate Foundry Co.....V
Isotta Fraschini.....IX

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J

	CHAPTER
J. M. Shock Absorber Co	V
Jackson Automobile Co	V
James, William Henry	I
Janney-Steinmetz & Co	V
Jeffery, Thomas B., Co	I:III:V:X
Jeffery, Thomas B	I:III
Jenatzy	IX
Jennings, Oliver G	V
Jewel	I
Jewett, Edward H	I
Jewett, Harry M	I:IV
Johnson	I
Johnston, R. H	I
Jones, H. P	V
Jones, Phineas & Co	V
Jones Speedometer Co	V
Jonz	I
Joy, Henry B	I:II:IV:V:VII
Joyce, David C	V
Joyce, Frank M	V
Judd, C. B	V

K

Kardo	V
Kaufman, Louis G	II:VIII
Kean, Hamilton	V
Kearns	I
Kellogg Mfg. Co	III:V
Kelley, Edward S	II
Kelly-Springfield Motor Truck Co.	V:X
Kelly-Springfield Tire Co	V:VIII
Kennedy, William P	I:XI
Kennerdell, Richard	V
Kent Atwater Mfg. Works	V
Killingly	VIII
King, Charles B	V
King Motor Car Company	I:V
King Edward VII	IX
Kinsey	I
Kissel-Kar	I
Kissel Kinnicutt & Co	VIII
Kissel Motor Car Co	I:V:VIII:X
Kittredge Lewis Harris	V
Kline Motor Car Corp	V:VIII
Klopsch	II
Knight	I
Knox Automobile Co	I:V:VIII:X
Knox, C. B	X
Knox, Harry	X
Knyff, Chev. Rene de	IX
Koehler	X
Kokomo Electric Co	V
Krupp	IV:V
Kuhn, Loeb & Co	VIII

L

Lacombe, Judge	II
LaCroix, Paul	V
Ladenburg, Thalmann & Co	VIII
Lambert	I
Lambert, Charles	X
Lambert Motor Truck Co	X
Lancia	IX
Lane	I
Langert Co	X
Lansden Motor Truck Co	X
Lashar, Walter B	II
La Turbie	IX
League of American Wheelmen	VII
Lear, Oscar, Automobile Co	X
Leather Tire Goods Co	V
Lee, Eliot C	V
Lee, Gilbert W	I
Lee-Higginson & Co	VIII
Lee, J. Elwood, Co	VIII
Lee, Richard H	V
Lee Tire & Rubber Co	V:VIII
Lafever Arms Co	V
Lehman Bros	VIII
Leiter, Joseph	X
Leland, Henry M	I:IV:V:XI:XII
Leland, W. C	I:V
Lenoir, Jean Joseph Etienne	I
Le Plant	X
Levagh	IX
Levassor	I:II:III:X
Lewin, C. H	V
Lewis Spring & Axle Co	V
Lewis, William Mitchell	I:V
Lexington-Howard Co	V:VIII
Liberty National Bank	VIII
Light Mfg. & Foundry Co	V
Lincoln Highway	VII
Lindsay Auto Parts Co	VI
Lindstrom, Charles L	X
Link Belt Co	V

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CHAPTER

Lion I
Little Giant X
Livingston & Co VIII
Livingston Radiator Co V
Lloyd, Robert McA V
Locomobile Company of America, I:V:VIII:IX:X
Logan Construction Co X
Long Distance I
Long Island Automobile Club ..... V:IX
Long Island Motor Parkway IX
Long Mfg. Co V
Loomis, Frank X
Los Angeles Speedway IX
Lovell F. Hallett V
Lovell MacConnell Mfg. Co V
Lozier I
Lozier Associated Purchasers VIII
Lozier Motor Co ..... V:IX
Ludlum, David S I
Lumen Bearing Co V
Lyon, Whitney V
Lyons-Atlas Co V
Lytle, Herbert IX

M

Maceroni I
Mack Motor Car Co ..... V:VIII:X
Mackintosh & Co III
Macy, V. Everitt V
Madison Square Garden V
Mahoning Rubber Co VIII
Mais Motor Truck Co X
Manhattan Automobile Co VIII
Manhattan Oil Motor Co X
Manufacturers' Contest Association V
Manufacturers Foundry Co V
Marion Motor Car Company ..... I:V:VIII
Marmon ..... I:V:VIII:IX
Marmon, Howard C V
Marquette Buick IX
Marvin, James Sterling ..... Int.:XI
Maryland Auto Truck Co X
Massachusetts Inst. of Technology X
Matheson ..... I:VIII
Maxwell-Briscoe ..... I:IV:V:VIII:X:XII
Maxwell, John D ..... I:IV
Maxwell Motor Co ..... V:VIII:IX:XII
Maybach, William I
Mays, Henry V
Maxim, Hiram Percy ..... V:X
McCord Mfg. Co V
McDonald, J. B I
McFarlan Motor Co V
McGraw Tire and Rubber Co V
McIntyre I
McKinley, President William ..... Int.:IX
Mead, M. S. M I
Mechanical Branch V
Meiselbach Motor Wagon Co X
Melvin, Edwin V
Mercedes ..... I:IX
Mercer Automobile Co ..... V:IX
Merrill, Lynch & Co VIII
Merryweather, G. E V
Messinger, S X
Metzger, William E ..... I:IV:V
Meyer, Eugene, Jr VIII
Mezger, C. A V
Michelin et Cie III
Michelin Tire Co V
Michigan Steel Castings Co V
Midgely Mfg. Co V
Midland I
Miehle Printing Press Co X
Milbank, W. E I
Milburn Wagon Co V
Miles, Samuel Arthur V
Miller Charles E V
Miller Rubber Co VIII
Miller, William W V
Milwaukee Automobile Co X
Mitchel I
Mitchell Lewis Motor Company, I:IV:V:VII:VIII
Mitchell Motor Car Company ..... V:VIII:X
Mayo, A. N VIII
Mobile Company of America, I:III:V:VIII:X
Moline Automobile Company ..... I:V
Monarch I
Moon Motor Car Company ..... I:V
Mora I
Morgan, J. P., & Co VIII
Morgan Motor Co X
Morgan, Ralph L X
Morgan & Wright ..... III:V:VIII
Morrell, R. Lee V
Morris I
Morris, Dave Hennen V
Morris & Salom X
Morris, W. G V
Morrison, William I
Morrow I

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	CHAPTER
Morrow Mfg. Co	VIII
Mors	IX
Morss, Charles A	VIII
Morton, J. Sterling	X
Morton Truck & Tractor Co	X
Moscovics, Fred E	IX
Mosler, A. R., & Co	V
Mosler, A. R	II
Motor Compressor Co	V
Motor Cups Holding Co	IX
Motor Products Co	VIII
Motor & Accessory Manufacturers, Inc.	V
Motsinger Device Co	V
Mott, S. C	V
Motz Co	VIII
Mulford, Ralph	IX
Munger Vehicle Tire Co	V
Munger Co	IX
Munsey, Frank A	IX
Munsey Tour	IX
Murdock, William	Int.:I
Mutual Motors Co	V

N

Napier	IX
Nash, Charles W	IV:V:VIII
Nathan	II
National Association of Automobile Manufacturers	V:IX:X
National Automobile Chamber of Commerce	V:VI
National Automobile & Electric Co.	V:X
National Carbon Co	V
National Electric Co	I
National Grange	VII
National Highways Association	VII
National Lead Co	V
National Legislative Convention	V
National Motor Carriage Co	X
National Motor Vehicle Co.,	I:V:VIII:IX
National Screw & Tack Co	V
National Transportation Co	X
National Tube Co	V
National Turnpike	VII
Navarre Hotel	V
Nazzaro	IX
Newby, A. C	V:IX:X
New Departure Mfg. Co	V:VIII
New England Electric Vehicle Transportation Co	X
New Haven Carriage Co	VIII:X
New Haven Clock Co	V
New Process Gear Corp	V
New Process Rawhide Co	V
New Jersey Spring & Rubber Co	V
New York Auto Truck Co	X
New York Central Lines	IX
New York Curb Market	VIII
New York Edison Co	V
New York Electric Vehicle & Transportation Co	X
New York Motor Vehicle Co	V
New York and New Jersey Lubricant Co	V
New York State Automobile Association	V
Nice	IX
Nice to Marseilles Race	IX
Nichols, James C	IX
Nobby Tread	II:VIII
Noera Mfg. Co	V
Nokolyd Signal Co	V
Nordyke & Marmon Co.	I:V:VIII:IX
Northern	I
Northeast Electric Co	V
Northern Securities Co	VI
Noyes, Judge	II
Nuckols, Henry W	VIII

O

Oakland Motor Car Co.	I:V:VIII:X
Ogle	I
Ohio Electric Car Co	V
Ohio Motor Car Co	I:V:X
Okey	I
Olcutt, 2nd, Dudley	V
Oldfield, Barney	IX
Olds Motor Works	I:II:V:VIII:XII
Old Reliable	X
Olds, Ransom E	I:IV:V:IX:X
Oliver Mfg. Co	V
Orr	IX
Otto, Albert	X
Otto, Dr. N. A	I:II:XI
Overland Automobile Co.	I:IV:VIII
Overman Tire Co	V
Owen Magnetic	I:VIII
Owen, Percy	I:V
Owen, Ray M	I:II:V:VIII:X

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P

	CHAPTER
Packard, J. W	I
Packard Motor Car Co.,	I:V:VII:VIII:X:XI
Paige Detroit Motor Car Co.	I:V:VIII
Paine, Asa	V
Palmer, Honore	V
Palmer, John Fullerton	III
Palmer & Singer	I
Panama Pacific Exposition	IX
Pan-American Exposition	V:IX
Pan-American Motor Co	V
Panhard & Levassor	I:II:III:IX:X
Pantasote Co	V
Pardington, A. R	V:VII
Paris-Amsterdam Race	IX
Paris-Bordeaux	IX
Paris-Dieppe Race	IX
Parish Manufacturing Co	V
Parish & Bingham Mfg. Co	V
Parker	IX
Parker, Elwell	X
Parker, R. A	II
Parry, D. M	I
Parsons, Harry	I:II
Pathfinder Co	I:V:VIII
Patschke	IX
Patterson, E. C	IX
Patterson Co., W. A	V
Pearson, Henry C	III
Peerless Motor Car Co.	I:V:VIII:IX
Peerless Truck and Motor Corp.	VIII
Pennsylvania	I
Pennsylvania Electric Vehicle Co.	X
Pennsylvania Rubber Co.	III:V:VIII
Pennsylvania Railroad	IX
Perfection Spring Co	V:XI
Perlman, The Rev. Lesser	II
Perlman, Louis Henry	II
Perlman Rim Corporation	II:VIII
Perrine, J. G	I
Persons, Charles G	VIII
Peugeot	I:III:IX
Phelps Motor Vehicle Co	V
Philadelphia Automobile Club	V
Phoenix Motor Vehicle and Engine Co.	X
Pickard	I
Pierce-Arrow Motor Car Co.	I:V:IX:X
Pierce, Dr	X
Pierce, George N	V
Pierce, Percy P	IX
Pierce-Racine	I
Pilot Motor Car Co	VIII
Pittsburgh Auto Car Co	X
Pittsburgh Automobile Club	V
Pittsburgh Electric	I
Pittsburgh Model Engine Co	V
Pittsburgh "6"	I
Pittsburgh Steel Products Co	V
Pittsfield Spark Coil Co	V
Planchet	IX
Planta, Major	I
Platt, C. E	X
Plymouth	X
Polack Tire & Rubber Co	V
Pomroy Brothers	VIII
Poole	IX
Pope, Albert A	I:III:VII
Pope, George	I:II:V:VIII
Pope Mfg. Co	V:VI:VIII:X
Pope Robinson Automobile Co	V
Pope-Toledo	I:II
Portage Rubber Co	V
Post, David J	V
Powers, A. L	V
Pneumatic Carriage Co	VIII
Prall Hot Water Patents	VIII
Premier	I
Premier Motor Corp	VIII
Premier Motor Manufacturing Co.,	I:V:VIII:X:XI
Prescott	I
Prest-O-Lite Co	V
Priestly, Dr	III
Princeton University Automobile Club	V
Pritchett, Hugh H	VIII
Prosser, Thomas, & Co	V
Providence Automobile & Truck Co.	X
Pulitzer	II
Pullen, Edward	IX
Pullman	I:V:VIII

R

Racine Mfg. Co	V
Racine Rubber Co	V
Racing Board	V
Rainey, Roy L	VIII
Rambler	I
Rands Mfg. Co	V:VIII
Ranier	I
Rapid Motor Vehicle Co	X

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CHAPTER

Raymond, H. E.....V
Read, William A., & Co.....VIII
Reading Motor Vehicle Co.....X
Redding, William A.....II:VI
Reed, J. A.....X
Reese Shriver E.....V
Reeves, Alfred.....Int.:V
Regal Motor Car Co.....I:V:XI
Regal Plugger.....XI
Reliance Motor Truck Co.....V:X
Remy Electric Co.....VIII
Renault, Freres.....I:IX
Renault, Louis.....I
Renault, Marcel.....I
Renting, E. A.....IX
Reo Motor Car Company, I:V:VIII:X:XI
Republic Rubber Co.....V:VIII
Resta, Dario.....IX
Rice, H. H.....V
Rice, Isaac L.....II
Richard-Brasier.....IX
Rider-Lewis.....I
Riker Electric Vehicle Co.....VIII:X

CHAPTER

Riker, Andrew Lawrence, I:II:III:IV:V:IX:X
Riker Motor Vehicle Co.....X
Rhode Island Automobile Club.....V
Robertson, George H.....IX
Robinson, Harvey.....V
Rockefeller, Percy A.....V
Rock Oil Co.....XI
Roessler & Hasslacher Chemical Co..V
Poger.....I
Rogers, Judge.....II
Rooney.....IX
Roosevelt, Theodore, Jr.....VIII
Roper, S. H.....I
Rose Mfg. Co.....V
Ross Gear & Tool Co.....V
Rowe, Dr. H. M.....V
Royal Automobile Club.....VI
Royal Equipment Co.....V
Royal Tourist.....I
Rudge-Whitworth Wheel.....XI
Russell Motor Axle Co.....V
Russell Motor Car Co.....VIII:X
Ryan, Thomas F.....II

S

Safety First Society.....V
Sager, J. H.....V
Salisbury, Marquis of.....III
Salisbury Wheel & Manufacturing Co.V
Salom.....I
Salomon, William & Co.....I:VIII
Solomons, Sir David.....I:VI
Sanborn, Judge.....II
Sanderson, Henry.....V
Sarthe Circuit.....IX
Saurer Motor Car Co.....I:V:VIII
Saxon Motor Co.....I:V:X
Saxon Motor Car Corporation....VIII
Sayers and Scoville.....X
Schacht.....I
Schimpf, William.....V
Schrader's, A. Son.....V
Schwartz Wheel Co.....V
Scripps-Booth.....I:VIII
Scarritt, Winthrop E.....V
Seabury, Charles L., Co.....V
Searchmont Automobile Co.....I:V
Selden, George Baldwin...Int.:I:II:VI
Selden, Henry R.....II
Selden Motor Vehicle Co.....I:II:V
Self-Propelled Traffic Association...VI
Seligman, Jefferson.....V
Seligman, J. & W., Co.....VIII
Senn, Dr.....II
Serpollet, Leon.....I:X
Sever, G. F.....X
Shaler, C. A., Co.....V
Shanks, Charles B.....IX
Sharp-Arrow.....I
Shattuck, Albert R.....V:IX
Shearson, Edward.....V
Shearson, Hamill & Co.....VIII
Sheepshead Bay Speedway.....IX
Shelby Steel Tube Co.....V
Sheldon Axle & Spring Co.....V
Shepard & Co.....X
Sheridan, H. K.....IX
Sherman Act.....VIII
Sherwin-Williams Co.....V
Shoppell, R. W.....II
Siemens-Holske Electric Co....VIII:X
Silvertown Cord Tires.....VIII
Simms Magneto Co.....V
Simplex Automobile Co.....I:V:IX
Sireno Co.....V
Sixty-ninth Regiment Armory.....V
Sloane, Alfred P., Jr.....V
Smith, A. O., Co.....V
Smith, E. B., & Co.....VIII

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CHAPTER

Smith, Frank E.....VIII
Smith, Frank W.....V
Smith, Fred L.....V
Smith, George Moore.....V
Smith, G. J.....IX
Smith, Harold O.....V:IX
Smith, Ralph W.....V
Smith, Wilton Merle.....V
Society of Automobile Engineers, V:IX:X
Souther, Henry.....V
Spacke, F. W., Machine Co.....V
Sparks-Withington Co.....V
Speare, Lewis R.....Int.:V
Speedweel I
Spicer Mfg. Co.....V
Splitdorf, C. F., Co.....V
Splitdorf Electric Co.....V
Sprague Umbrella Co.....V
Springfield Metal Body Co.....V
Spurr, Charles W.....V
Standard 90-Day Warranty.....X
Standard Oil Co.....II:X:XI
Standard Steel Car Co.....VIII
Standard Tool Co.....V
Standard Thermometer Co.....V
Standard Welding Co.....II:V
Stanley I
Stanley Brothers Automobile Co., I:VIII:X
Stanley Electric Manufacturing Co. VIII
Starr, Edward D.....I
Straus, Alexander.....II
Staver-Chicago I
Steamobile Co.....V
Stearns, Frank B.....I
Stearns, F. B., Co.....I:VI:VIII:IX

CHAPTER

Steel Products Co.....V
Sterling L
Sterling Motor Truck Co.....V
Sterling X
Sternberg X
Stevens, J., Arms & Tool Co.....V
Stewart, W. J.....V
Stewart-Warner Speedometer Corp...V
Stevens-Duryea Co.....I:V:VIII
Stiger, C. W.....V
Stillman, G. F.....III
Stillman, James A.....V
Strieby & Foote Co.....V
Stoddard-Dayton .....I:IX
Storage Power Co.....VIII
St. Louis Carriage Co.....X
St. Louis Exposition.....IX
St. Louis Motor Carriage Co.....V
Strawbridge & Clothier.....X
Stromberg Motor Devices Co.....X
Studebaker Corp., The, I:III:IV:V:VIII:X
Studebaker, George N.....V
Sturges Electric.....I
Stutz Automobile Co.....I:V:VIII:IX
Sultan I
Sulzberger Sons Co.....V
Sunbeam IX
Summers I
Swartwout, Richard H.....VIII
Swartwout & Appenzellar.....VIII
Swinehart Clincher Tire & Rubber Co. V
Swinehart Tire & Rubber Co..V:VIII
Sweet, William Montgomery.....V
Swetland, Horace Monroe.....V:IX
Swift & Co.....X
Szisz IX

T

Taft, William H.....II
Talmage, T. DeWitt.....II
Taylor, Henry T.....V
Taylor Instrument Co.....V
Teasdale, W. C., Jr.....I
Technical Board.....V
Temple, W. C.....V
Terry, Charles Thaddeus.....V:VI
Thery IX
Third Avenue R. R. Co.....X
Thomas, A. W.....III
Thomas, E. R., Detroit Motor Car Co. .....I:IV
Thomas-Detroit I
Thomas, E. R., Motor Car Co., I:IV:V:VIII:XI
Thompson, C. E.....V
Thompson, Elmer.....V
Thompson, Jefferson Demont.....V
Thomson, R. W.....III
Three A's.....V:VII
Tillinghast, Pardon W.....III
Tillotson Wolcott Co.....VIII
Times-Herald Road Race.....I:IX:X
Timken, H. H.....X
Timken-Detroit Axle Co.....V:X

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CHAPTER

Timken Roller Bearing Co.....V
Tinken, E. R.....VIII
Titcomb, W. J.....V
Toledo Motor Co.....VIII
Tour De France.....IX
Torbenson Motor Car Co.....X
Touraine VIII
Touring Board.....V
Taylor, B.....IX
Tracy, Joseph.....IX
Trask, Spencer & Co.....VIII
Trevithick, Richard.....Int.:I:II
Twentieth Century Mfg. Co.....V
Twichell Patent.....III
Tyer Rubber Co.....V

U

Underwood Fred D.....V
Union X
Union Automobile Co.....V
Union Drawn Steel Co.....V
Union League Club.....V
United Motor Corporation.....VIII
United States Motor Co....IV:V:VIII
Upton Machine Co.....V
U. S. Long Distance Automobile Co..V
U. S. Light & Heating Co.....V
U. S. Rubber Co.....III:V:VIII
U. S. Tire Co.....III:VIII
Utility Co.....V

V

Vacuum Oil Co.....II:V
Valentine & Co.....V
Vanadium Metal Co.....V
Vanderbilt Challenge Cup.....V:IX
Vanderbilt, Commodore.....III
Vanderbilt Cup Commission.....V
Vanderbilt, William Kissam, Jr., Int.:V:IX
Van Dervoort, W. H.....V
Vanguard Machine Co.....VIII
Van Sicklen Co.....V
Van Wagener Mfg. Co.....V
Veeder Mfg. Co.....V
Vehicle Equipment Co.....X
Velie Motor Vehicle Co.....I:V:VIII
Vesta Accumulator Co.....V
Veile, W. S.....IX
Vim Motor Truck Co.....V:X
Volute Spring Shock Absorber Co...V
Voorhees Rubber Mfg. Co.....V

W

Wagner Electric Mfg. Co.....V
Wagner, Fred J.....IX
Wagner, Louis.....IX
Wainwright, L. M.....V
Waltham Mfg. Co.....V
Walker, John Brisben...V:VIII:IX:X
Walburn, Thomas S.....IV
Walker, Percy J.....V
Walker, Roberts.....Int.
Walker Vehicle Co.....X
Walker, D. S.....V
Walter .....I:II
Walter Motor Truck Co.....V:X
Waltham-Orient I
Waltham Manufacturing Co.....V
War College.....VII
Wanamaker, John.....II:V
Warburton, Barcley H.....V
Ward Leonard Electric Co.....V
Ward Motor Vehicle Co.....X
Warner Gear Co.....V
Warner Instrument Co.....V
Warner Manufacturing Co.....V
Warren, Charles B.....I
Warren Fisk.....I
Ward, Judge.....II
Washington Auto Bus Co.....X
Watt, James.....I
Watterson, Henry.....II
Waukesha Motor Co.....V
Waverley Co., The.....I:V:X
Wayne Automobile Co.....V
Webb, Christopher.....V
Webb, Frank G.....Int.:V
Webb Motor Fire Engine Co.....X
Webb Manufacturing Co.....V
Webster, Daniel.....III
Weed Chain Tire Grip Co.....II:V
Welch, Charles K.....II:III
Welch Motor Car Co.....I:II:V
Welles, R. H.....V
Wells, E. P.....V

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CHAPTER

Wells, G. A.....X
Westcott Motor Car Co.....V
Western Wheel Works.....IV
Westinghouse Electric & Machine Co.....V:VIII
Westinghouse, George, & Co.....II
Weston-Mott Co.....V
Wexler, Sol.....V:X
Wheeler, E. D.....II
Wheeler & Schebler.....V
Whiting, A. H.....V:IX
Whitney, C. E.....I:II:V
Whitney Mfg. Co.....V
Whitney, William C...I:II:VI:VIII:X
Whipple, Harlan W.....V
White, Thomas H.....VIII
White, Henry.....VIII
White, H. S.....V
White, Rollin H.....I:X
White, Weld & Co.....VIII
White, Windsor T.....I:IV:V
White Company, The, I:V:VII:VIII:X:XI
White Sewing Machine Co....VIII:X
Whitely Steel Co.....V
Whitlock Coil Pipe Co.....V
Whitridge, Frederick W.....V
Wickham, H. A.....III
Widener, P. A. B.....I:II:VIII:X
Wilcox.....IX
Willard Storage Battery Co.....V
Willis, H. A., & Co.....VIII
Williams, Harrison.....VIII
Williams, J. H., Co.....V
Wilkinson, John.....I:II:III
Willys, John North.....I:IV:V:VIII
Willys Overland Co., I:IV:V:VIII:X:XII
Wilson, John A.....V
Wilson, Woodrow.....VI
Winchester Speedometer Co.....V
Winslow, Arthur S.....V
Winton Alexander, I:II:IV:V:VI:VIII:X:XI:XII
Winton Motor Carriage Co..I:V:X:XI
Winton Motor Car Co...V:VI:VIII:X
Winton Co., The.....VIII
Wishart, Spencer E.....IX
Wolverine Lubricants Co.....V
Woods Charles E.....X
Woods, Charles E., Vehicle Co.....X
Woods Motor Vehicle Co..I:V:VIII:X
Worth, Jack.....X
Worth Motor Vehicle Co.....X
Wray Pump & Register Co.....V

Z

Zenith Carbureter Co.....V
Ziegler, William, Jr.....IX
Zimmerschied, Karl W.....V

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